



Connecticut Highway Safety Improvement Program (HSIP) Implementation Plan for FFY 2022



Connecticut Department of Transportation
Bureau of Engineering and Construction
Division of Traffic Engineering – Safety Engineering

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Connecticut HSIP Implementation Plan

Executive Summary

This Highway Safety Improvement Program (HSIP) Implementation Plan for Connecticut documents the HSIP obligations and actions the state will take for the 2022 Federal Fiscal Year (FFY). This plan is required because the Federal Highway Administration (FHWA) notified the State that Connecticut did not meet or make significant progress toward meeting the 2019 safety performance targets, based on the five (5) - year moving averages for 2015-2019. This is the second year of not meeting the targets. In September 2020, the state of Connecticut submitted an HSIP Implementation Plan for FFY 2021. That plan documented HSIP funding and project decisions made in order to meet or make significant progress toward meeting Connecticut's safety performance targets in subsequent years. Projects in the FFY 2021 Implementation Plan are in various stages of study and design. Some of the projects will progress to final design and construction phases, and those will be included in the FFY 2022 HSIP Implementation Plan.

The requirement to prepare this HSIP Implementation Plan is not viewed as a penalty since the Connecticut Department of Transportation (CTDOT) has made a commitment to safety and has obligated all its annual HSIP apportionment over the past several years. Under this Plan, CTDOT proposes to obligate \$38,836,199 of HSIP funding which is above the requirement of \$30,149,166. Also, CTDOT took this opportunity to again re-evaluate its HSIP investment decisions and identify gaps and deficiencies to ensure that projects identified, prioritized, and programmed have the best potential for reducing fatalities and serious injuries. Consideration is also being made to help Connecticut meet safety performance targets in subsequent years. In order to make these decisions for this HSIP Implementation Plan, CTDOT reviewed fatality and serious injury crash data on all public roads from 2018 to 2020 utilizing the Connecticut Crash Data Repository (CTCDR).¹

The evaluation of historical HSIP funded project expenditures shown in the expenditures section in Decision Support Framework Actions table below was used to inform this plan but does not take into consideration the impacts of the HSIP funded projects that have recently been implemented. The framework for this plan is based on the Decision Support Framework Actions from the FHWA Office of Safety's HSIP Implementation Plan Guidance dated October 13, 2017 shown below:

Decision Support Framework Actions	
Review Fatality and Serious Injury Trends	<ul style="list-style-type: none">• Compare Statewide trends vs COGs and districts.• Compare trends by SHSP emphasis area, urban/rural designation, functional class, roadway ownership.
Review HSIP Expenditures	<ul style="list-style-type: none">• Compare the proportion of HSIP expenditure by SHSP emphasis areas, urban/rural designation, functional classification, roadway ownership to determine if the proportion of fatalities/serious injuries align with where the problems are occurring.
Review Historical Project Performance	<ul style="list-style-type: none">• Which countermeasures were implemented?• Where were countermeasures implemented?• What crash types were these countermeasures addressing?

¹ See UConn Crash Data Repository: <https://www.ctcrash.uconn.edu/>

Decision Support Framework Actions

	<ul style="list-style-type: none"> • Were these countermeasures and crash types identified as a priority in the SHSP? • What was the outcome (i.e., countermeasures effectiveness)?
Identify Gaps or Deficiencies	<ul style="list-style-type: none"> • Review data and information to determine any gaps and deficiencies. • Determine program modifications to ensure projects are identified, prioritized and programmed properly and have the best potential to reduce fatalities/serious injuries.
Identify Noteworthy Practices	<ul style="list-style-type: none"> • Review literature on noteworthy practices that address State-specific crash characteristics. • Identify noteworthy practices that have not yet been implemented and consider them in the HSIP.
Conduct Stakeholder Outreach	<ul style="list-style-type: none"> • Engage safety stakeholders in a discussion about program needs and potential solutions.
Develop HSIP Implementation Plan	<ul style="list-style-type: none"> • Use input from gap analysis, literature review, and safety stakeholders as a starting point for development of the HSIP Implementation Plan.

Available Funding

Under 23 U.S.C. 148(i)(1), Connecticut did not meet or make significant progress towards meeting safety performance targets and must obligate HSIP funds in the amount apportioned for the prior year. As a result, Connecticut must obligate at least \$30,149,166 in FFY 2022, which was the apportionment amount for FFY 2018.

Funding Allocation Goals

The HSIP Implementation Plan must describe how HSIP funds will be allocated during the plan period (23 U.S.C. 148(i)(2)(C)). In determining these obligation allocation goals, Connecticut considered obligating needs by crash type (e.g. pedestrian, roadway departure, angle), as well as other categories such as roadway ownership (e.g. state vs. local roads) and improvement type (e.g. spot vs. systemic).

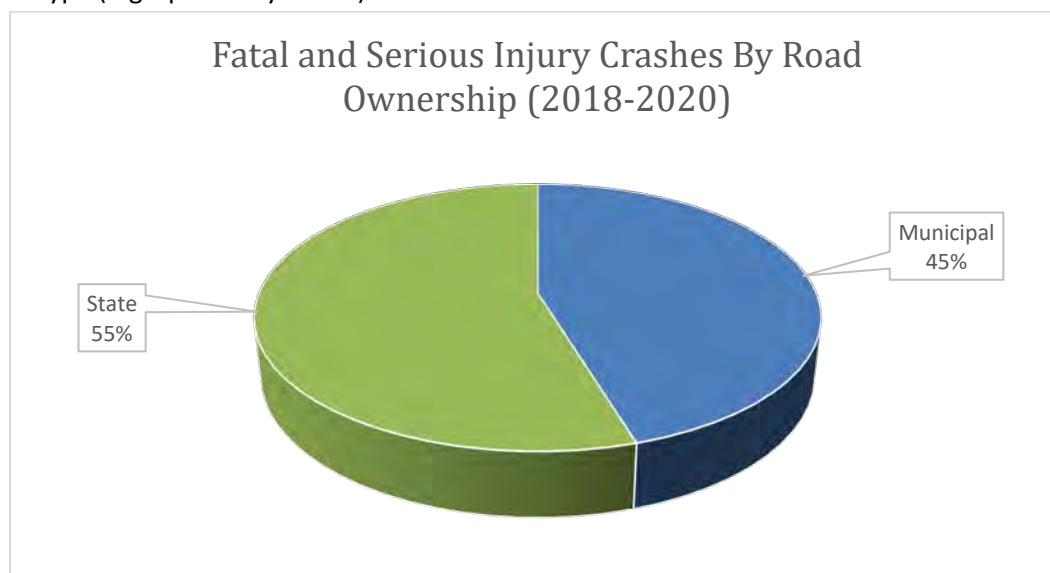


Figure 1: Distribution of Crashes by Road Ownership

HSIP Programs, Strategies, and Activities

The State's HSIP Implementation Plan must identify a combination of programs, strategies, and activities to be funded under the HSIP that will (1) contribute to a reduction in fatalities and serious injuries [23 U.S.C. 148(b) & 150(b)(1)] and (2) help the State achieve or make significant progress towards achieving their safety performance targets in subsequent years [23 U.S.C. 148(i)(2)(D)]. The HSIP programs, strategies, and activities must address roadway features that constitute a hazard to road users, as well as highway safety improvement projects that were identified based on crash experience, crash potential, or other data-supported means. 23 U.S.C. 148(i)(2)(A)(B).

Crash Analysis

A review of the Statewide Crash Data (see Connecticut Fatal and Serious Injury Crash Tree in Appendix E) shows that the crash data continues to show the same patterns exhibited during the creation of Connecticut's current Strategic Highway Safety Plan and as shown in the [FFY 2021 Connecticut HSIP IP](#). In addition, the crashes are split approximately evenly along roadway ownership (55% State System vs 45% Municipal System, see Figure 1 above).

For the purposes of analysis, Roadway Safety Object and Other Stationary Object crash fields were added together to establish the Roadway Departure Crash category. As Connecticut's current SHSP lists both pedestrian and bicyclist together under the Vulnerable User Emphasis Area and the FHWA Safety Performance Target Assessment indicated that the "number of non-motorized fatalities and serious injuries" safety target was not met, the crash data of these two categories were combined in this report. However, as the crash data shows pedestrian crashes are 16% of the statewide total of fatal and serious injury crashes while bicyclists are 1%, only strategies targeting pedestrian crashes were assessed in this report. Hereinafter, vulnerable users will be discussed as pedestrians. As shown in Figure 2 below, the top three crash types include Roadway Departure, Angle, and Pedestrians. Roadway Departure accounts for 24% or 1,022 crashes, Angle accounts for 23% or 968 crashes, and Pedestrians account for 17% or 734 crashes.

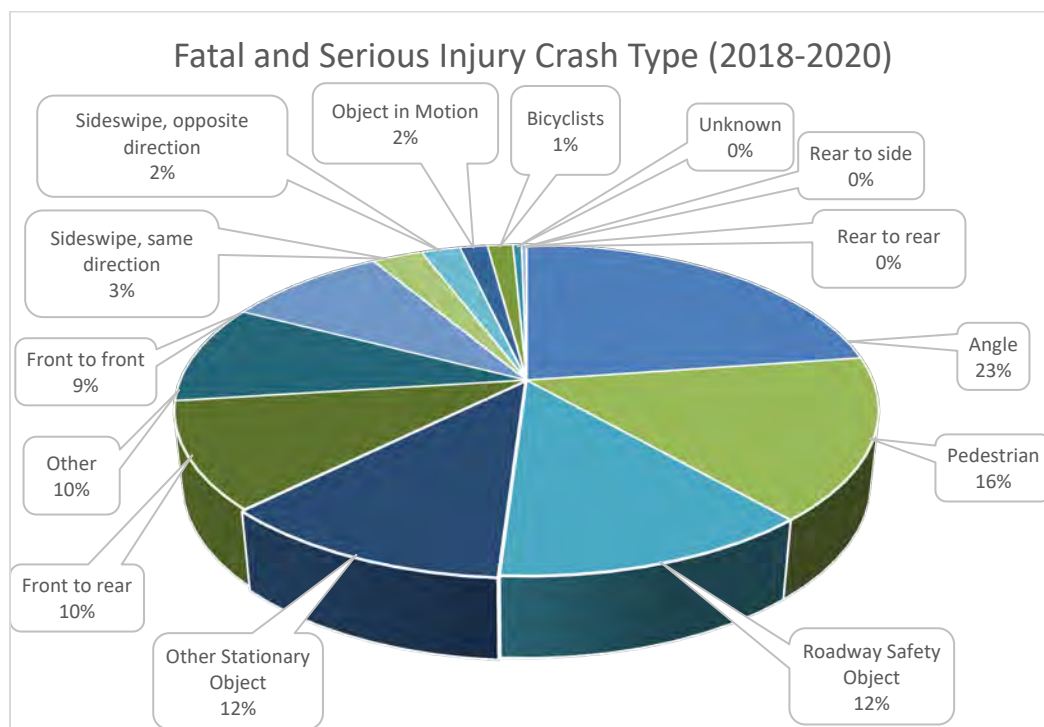


Figure 2: Distribution of Crash Type for Fatal and Serious Injury Crashes throughout the State

The crash data was also disaggregated by sections of the State. Connecticut is separated into four construction and maintenance Districts within the CTDOT and into nine Councils of Government (COGs). Projects throughout the State are allotted to the four districts in an effort to establish distribution of funding. A critical role of the nine COGs is to be stakeholders who provide feedback to the CTDOT on behalf of their member municipalities as regional planning organizations. In order to provide an understanding of how the Districts and COGs are affected by the HSIP IP, the following is a breakdown of fatal and serious injury crashes by District and by COG.

From 2018-2020 Districts 1 and 3 account for 31% and 38%, respectively, of the fatal and serious injury crashes throughout the state, while District 2 accounts for 11% and District 4 accounts for 20%. This is shown in Figure 3 below.

Of the COGs within Districts 1 and 3, the Capitol Region COG (CRCOG) accounts for the most fatal injury and suspected serious injury crashes throughout the state with 27%, followed by the South Central Region COG (SCRCOG) with 21%. Western Connecticut COG (WestCOG) and Naugatuck Valley COG (NVCOG) each account for 13%, Connecticut Metropolitan COG (MetroCOG) accounts for 11%, Southeastern Connecticut accounts for 6%, Lower Connecticut River Valley COG (RiverCOG) accounts for 4%, Northwest Hills COG (NHCOG) accounts for 3%, and Northeastern Connecticut COG (NECOG) accounts for 2%. These crash percentages are shown in Figure 4 below.

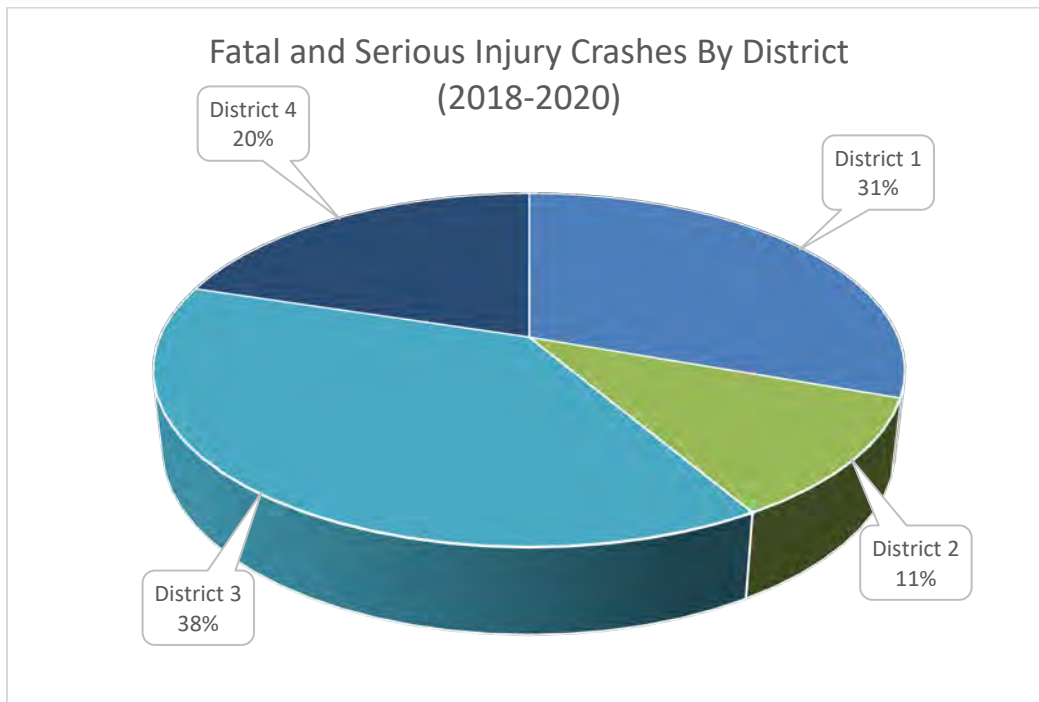


Figure 3: Distribution of Fatal and Serious Injury Crashes by District

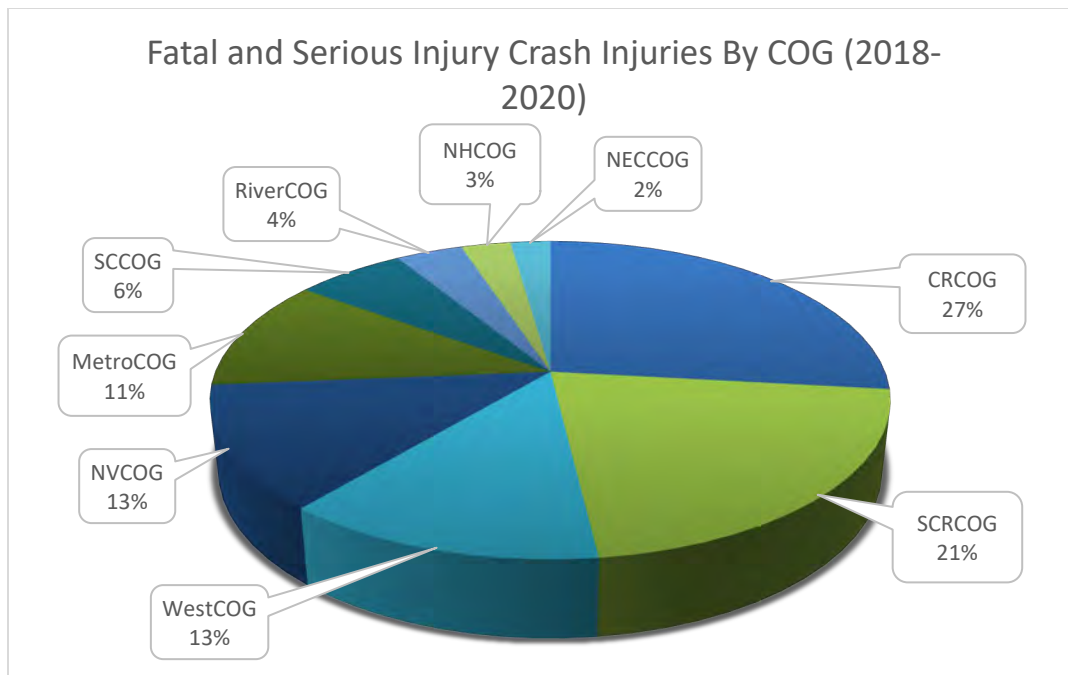


Figure 4: Distribution of Fatal and Serious Injury Crashes by COG

CRCOG is located almost entirely within District 1. SCRCOG is located almost exclusively in District 3. The largest of Connecticut's cities are located in the CRCOG and SCRCOG regions.

Looking at the crash data from 2018-2020, 16% of overall crashes include pedestrians, as shown in Figure 2. In terms of roadway ownership, 55% of pedestrian crashes occurred on municipal roadways, 34% occurred on state roadways, and 8% of pedestrian fatal and serious injury crashes occurred where classification was unknown as shown on the Fatal and Serious Injury Pedestrian and Bicycle Crash Tree provided in Appendix E.

A list of fatal and serious injury crashes by municipality is provided in the Fatal and Serious Injury Crash Rates by Municipality list in Appendix E. The list provides a breakdown of fatal and serious injury crash rates in order from highest percentage to lowest percentage. The municipalities with the ten highest percentages have been highlighted to show largest impacted municipalities.

Overall maps showing crashes by District and COG are provided in Appendices C and D, respectively. Crash Trees to show classification by crash type, COG, District, Municipal and State Road, and overall data are provided in Appendix E.

Review of HSIP Expenditures

A review of the HSIP project funding expenditures between 2013 and 2020 revealed \$189,866,122 was allocated to state roads and \$47,059,951 was allocated to municipal roads². This correlates to 68% of total funding for state roads, 17% for municipal roads, and 15% on non-roadway expenditures (see Figure 5). Between 2018 and 2020, 64% of total funding was allocated to state roads, 20% to municipal roads, and 16% to non-roadway expenditures. The three years of crash data analyzed for fatal and serious injury crashes revealed that 55% of crashes occurred

² See Figure 5 "Percent Distribution of Expenditures on Municipal and State Systems (2013-2020)" on page 10.

on state roads and 45% occurred on municipal roads.³ Figures 1 above and 6 below show percentages of expenditures and crashes on each roadway system. As similar to the data in the FFY21 Implementation Plan, the data suggests that expenditure allocation should be redistributed to increase amounts to municipal systems in order to address what the most recent crash data has shown.

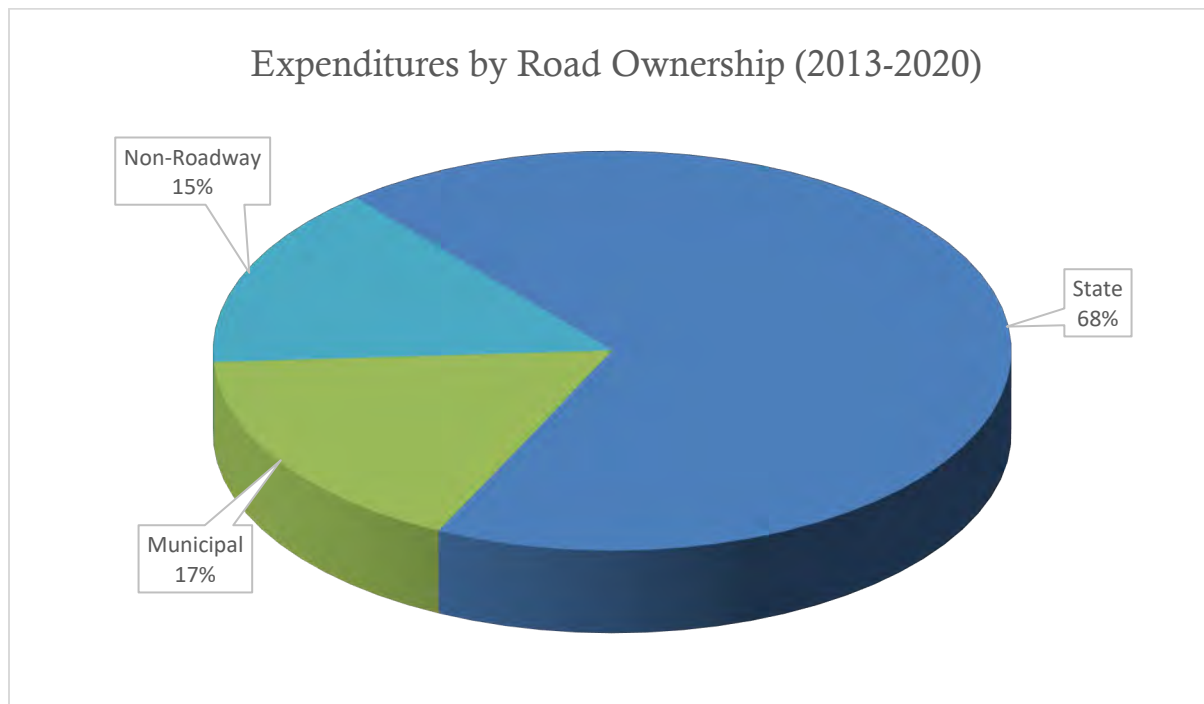


Figure 5: Percent distribution of expenditures on municipal and state systems (2013-2020)

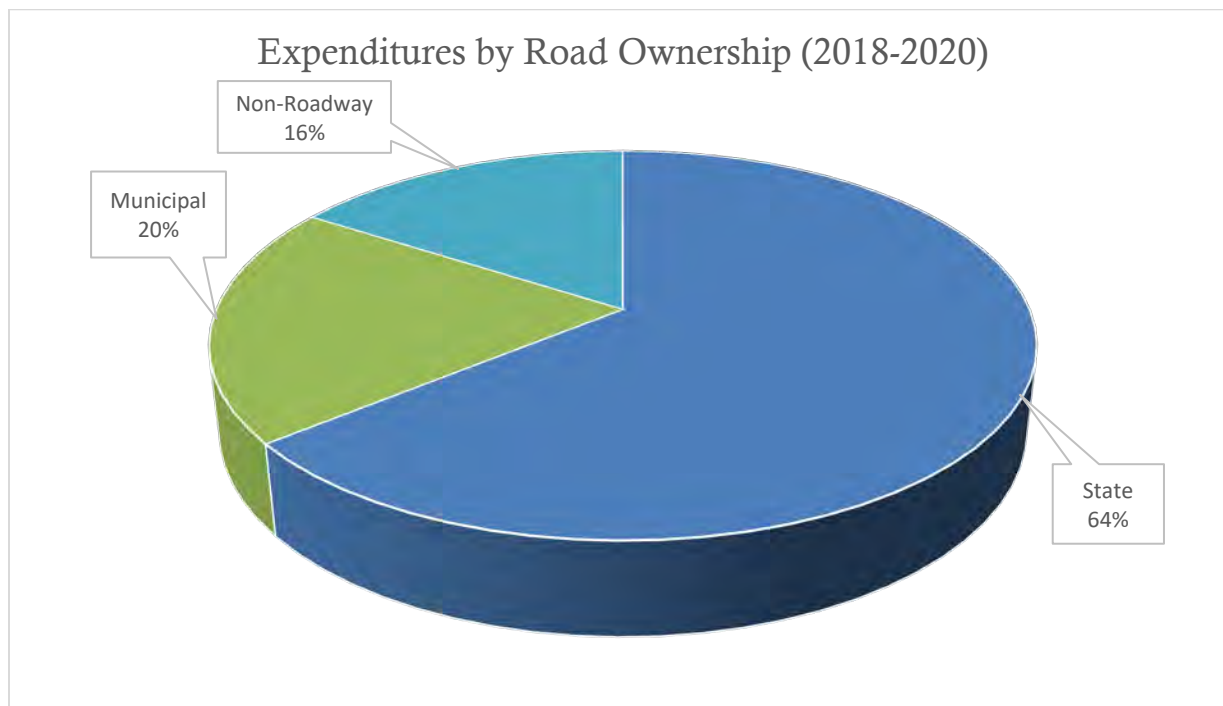


Figure 6: Percent distribution of expenditures by road ownership (2018-2020)

³ See Figure 1 “Distribution of Crashes by Road Ownership” on page 6.

Review of Historical Project Performance

As with the FFY 21 HSIP Implementation Plan, no formal before and after studies were conducted with this Plan, as many of the projects that have been implemented do not have enough data to determine their effectiveness. As with the previous plan, this plan continues to include projects focused on FHWA Proven Safety Countermeasures. There are also studies that were conducted under the FFY 2021 HSIP Implementation Plan that will be advanced to the design or construction phase in this plan. A review of project performance and effectiveness will be conducted when the appropriate amount of data is available.

CTDOT'S Connecticut Roadway Safety Management System (CRSMS) can be used for assessing the safety effectiveness of implemented projects through the Safety Effectiveness Evaluation Module. The Module includes crash data from 2013 to 2020. Newer crashes are added as they become available. To get reliable assessment, it requires at least 3 years of crash data before the project implementation and 3 years of crash data after the project implementation. This means as of 2021 the projects to be assessed in CRSMS need to be implemented between year 2016-2017, to have at least 3 years before and 3 years after crash history. For newer projects, as soon as 3 years after data is available, their effectiveness could be evaluated through CRSMS. In addition, interchange junctions and local maintained intersections currently have limited representation in CRSMS because the statewide data is still under collection. Effectiveness evaluation for projects at local intersections or within interchange areas cannot be performed until the data is ready. The interchange sites and local intersections are expected to be added to CRSMS by the end of 2022. In the meanwhile, Connecticut specific Safety Performance Functions (SPFs) have been developed for use in network screening and project assessment, and they are expected to be updated using the latest data by the end of 2022.

Identification of Gaps and Deficiencies

Data collected and analyzed for this report indicated that municipally owned roadways could benefit from a greater share of the HSIP funding for FFY 2022. Between 2018 and 2020, 45% of the total serious injury and fatality crashes occurred on municipal roadways while only 20% of expenditures were allocated to municipal roadways.⁴

The proposed Project List for FFY 2022 is comprised of projects and studies that are 22% municipal, 68% state, and 10% statewide. The intent of the studies that are proposed on municipal roads is to generate data driven systemic projects for municipal roads, which can then progress to the design and construction phases. The CTDOT intends to include additional design and construction projects for municipal roads in future years as a direct result of the proposed studies in the FFY 2022 Project List.

Vulnerable users have also been recognized throughout the crash data analysis as having an increased amount of fatal and serious injury crashes from 2018 - 2020. From 2018 through 2020, 17% of fatal and serious injury crashes involved a vulnerable user (16% pedestrian and 1% bicyclist).⁵

Identification of Noteworthy Practices and Stakeholder Outreach

Geographical information for each crash was compiled and separated by COG and District and provided to each respective COG and to the Highway Safety Office prior to conducting stakeholder outreach. The crash data was analyzed for each COG and District to establish trends in day, time, crash types, roadway classifications, and

⁴ See Figure 1 "Distribution of Crashes by Road Ownership" on page 6 and Figure 6 "Percent Distribution of Expenditures By Road Ownership (2018-2020)" on page 10.

⁵ See Figure 2 "Distribution of Crash Type for Fatal and Serious Injury Crashes throughout the State" on page 7.

locations of crashes. The analysis pages for statewide crashes, District crashes, and COG specific crashes are provided in Appendices B, C, and D respectively.

Stakeholder outreach was conducted with all nine COGs and two Divisions within CTDOT, the Highway Management Unit and the Highway Safety Office for input on this plan. Based on meetings with the COGs and crash data analysis, various needs were identified specific to each COG. As a result systemic and systematic projects were proposed within each region. The systemic and systematic projects that fit within several regions are proposed in the FFY 2022 HSIP.

During the stakeholder outreach meetings with the COGs, each group expressed concerns largely centered around the three program areas; Roadway Departure crashes, Angle/Intersection crashes, and Pedestrian crashes. All groups expressed concerns with pedestrian safety and pedestrian connectivity within their regions. The Raised Intersection Study was met favorably as a way to address pedestrian crashes by identifying proper locations for raised intersections. The Capitol Region, Southern Connecticut, South Central Regional, and Western Connecticut COGs requested the state provide centerlines and edge lines in specific areas on municipal roadways to address roadway departures. The Naugatuck Valley, Southern Connecticut, Lower Connecticut River Valley, South Central Regional, Western Connecticut, and Metropolitan COGs all favored a Roundabout Study within their area to mitigate intersection crashes.

Decision Support Framework

The State of Connecticut is utilizing data driven planning to establish proposed programs. A focus was set on systemic projects to provide widespread improvements throughout the state. The analysis resulting in the combination of location and type of crash was used to establish focus areas throughout the Connecticut roadway system. Crash data analysis indicates that a higher level of expenditures should be allocated to municipal roadways in an effort to equitably divide expenditures in line with the crash data. As established through the crash review, trends based on crash types were determined and were condensed into three (3) crash program types. The program areas are Roadway Departure, Angle/Intersection crashes, and Pedestrians, a combination of which represents 64% of crashes from 2018-2020.⁶ The program areas for this implementation plan align with the previous plan, and many of the projects identified in FFY 2021 will carry over into this Plan.

Program Areas

As indicated in the previous section, the program areas determined under the FFY 2022 HSIP IP are Roadway Departure crashes, Angle/Intersection crashes, and Pedestrian crashes. For each of these program areas, there is a listing of strategies or countermeasures, including their purpose, type of cost (actual cost for most are TBD), methodology, implementation (state roads and municipal roads), and benefits on how the strategy or countermeasure will help Connecticut make progress toward achieving the safety performance targets in subsequent years. These proposed programs are above and beyond the current obligation as the projects determined in FFY 2021 exceed the program goals.

Proposed Programs

A compiled project list is provided in Appendix A and includes ongoing projects from the HSIP IP FFY2021. The projects are progressing in planning, design, and implementation as a result of FFY2021 funding and associated expenditures are

⁶ See Figure 2 “Distribution of Crash Type for Fatal and Serious Injury Crashes throughout the State” on page 7.

included in the FFY 2022 plan. A summary of the ongoing projects is included in Table 1 below. Additional projects listed below are designed to complement and extend the ongoing projects.

Table 1: Ongoing Projects and Descriptions

Project Mitigation Type		
Roadway Departure	Intersection	Pedestrian
<ul style="list-style-type: none"> Horizontal Alignment Signing <ul style="list-style-type: none"> Construction on state roads in Districts 1 and 2. Design of horizontal curve signs on municipal roads. High Friction Surface Treatment (HFST) <ul style="list-style-type: none"> Design and construction of HFST on state roads. 	<ul style="list-style-type: none"> Traffic Signal Improvements <ul style="list-style-type: none"> Traffic signal safety improvements on state roads. Signing and Pavement Markings at Unsignalized Intersections <ul style="list-style-type: none"> Continue with design on state roads. Initiate design on municipal roads. Intersection Improvements <ul style="list-style-type: none"> Improvements at spot locations on both state and municipal roads. 	<ul style="list-style-type: none"> Rectangular Rapid Flashing Beacon (RRFB) <ul style="list-style-type: none"> Continue design on both state and municipal roads. Pedestrian Improvements at Signalized Intersections <ul style="list-style-type: none"> Continue design at state owned signalized intersections

Pavement Markings on Municipal Roadways

Purpose:

Roadway departures are within the top three highest percentile of fatal and serious injury crashes.⁷ Of crashes on municipal roadway segments, 45% of fatal and serious injury crashes were attributed to roadway departure.⁸ Installing pavement markings on municipal roadways which currently do not have pavement markings (specifically centerlines and where width allows, edge lines) will provide approach guidance for vehicles on the travel way.

Cost: Planning Study: \$500,000

Methodology and Implementation Plan:

As requested during stakeholder outreach, the CTDOT will work with municipalities to compile a statewide planning study to determine municipal roads in each town that will benefit from centerlines and edge lines based on AADT, width, length, and functional classification. The study will result in a determination of which roadways should be considered for pavement markings and documents such as technical memoranda, pamphlets, or flyers to educate municipal leaders about the benefits of durable pavement markings.

Benefits:

- Pavement markings provide guidance on a clear path for travel.⁹
- Drivers will be aware of horizontal curves within the roadway.⁸
- Drivers are less likely to exit the roadway errantly.⁸

⁷ See Figure 2 “Distribution of Crash Type for Fatal and Serious Injury Crashes throughout the State” on page 7.

⁸ See “Connecticut Fatal and Serious Injury Crash Tree” in Appendix E.

⁹ See FHWA “The Benefits of Pavement Markings: A Renewed Perspective Based on Recent and Ongoing Research”; https://safety.fhwa.dot.gov/roadway_dept/night_visib/pavement_visib/no090488/.



High Friction Surface Treatment

Purpose:

High friction surface treatment is intended to mitigate the frequency of roadway departure crashes throughout the state of Connecticut. High friction surface treatment provides additional traction on roadways to prevent slipping and overall roadway departure. Roadway departures account for 24% or 1,022 fatal or serious injury crashes in the state of Connecticut⁷.

Cost: \$700,000 statewide

Methodology and Implementation Plan:

CTDOT will coordinate with each district to initiate four preliminary design projects on state owned roadways to identify and design new locations for high friction surface treatment.

Benefits:

- Provides additional traction for vehicles travelling on state roadways.¹⁰
- Districts will be able to reduce roadway departure within frequented roadways.⁸
- High Friction Surface Treatment is an FHWA Proven Safety Countermeasure and provides a 52% severe crash reduction in wet road conditions and a 24% reduction in curve crashes¹¹.

Roundabout Study

Purpose:

Intersection crashes account for 47% of fatal and serious injury crashes on municipal roads and 44% on state roads¹². Based on the number of intersection crashes found and given that roundabouts are a proven safety countermeasure, a roundabout study will be initiated. This statewide study will be focused on determining which existing intersections would benefit from a roundabout.

Cost: Study - \$2,400,000

¹⁰ See CTDOT "Better Traction Saves Lives: High Friction Surface Treatment"; <https://portal.ct.gov/-/media/DOT/documents/dtrafficdesign/Safety/HFSTpdf.pdf>

¹¹ See FHWA "Proven Safety Countermeasures: Enhanced Delineation and Friction for Horizontal Curves"; https://safety.fhwa.dot.gov/provencountermeasures/enhanced_delineation/

¹² See "Connecticut Fatal and Serious Injury Crash Tree" in Appendix E

Methodology and Implementation Plan:

The CTDOT will evaluate the existing intersections within the region experiencing the highest number or rate of crashes at intersections, including pedestrian crashes, and evaluate improvements based on criteria for roundabouts. The study will provide the framework for roundabout design projects in the future. Roadways classified as state and municipal roadways will be equally eligible.

Benefits:

- To establish good candidate locations for roundabouts in order to allow a smooth design and construction process and to better develop the use of these proven safety countermeasures in Connecticut.
- Providing written justification and data driven results for roundabouts allows for better communication with municipalities and the public.
- Roundabouts are an FHWA Proven Safety Countermeasure with an 82% reduction in severe crashes for two way stop controlled intersections converted to roundabouts and a 78% reduction in severe crashes from a signalized intersection to a roundabout¹³.



Raised Intersection Study

Purpose: Of pedestrian fatal and serious injury crashes in Connecticut, on state roads 44% of crashes occur at intersections and on municipal roads 47% occur at intersections¹⁴. Based on the number of pedestrian crashes found in the most recent data and given that raised intersections are part of the Safe Transportation for Every Pedestrian program (STEP), a raised intersection study will be initiated¹⁵. This study will be focused on determining which existing locations would benefit from a raised intersection. Per stakeholder outreach information, the Western Council of Governments will pilot this study to establish future planning and improvement in other regions.

Cost: Planning Study: \$300,000

¹³ See FHWA "Proven Safety Countermeasures: Roundabouts"; <https://safety.fhwa.dot.gov/provencountermeasures/roundabouts/>

¹⁴ See "Fatal and Serious Injury Pedestrian and Bicycle Crash Tree" in Appendix E

¹⁵ See FHWA "Safe Transportation for Every Pedestrian (STEP)"; https://safety.fhwa.dot.gov/ped_bike/step/

Methodology and Implementation Plan:

The CTDOT will evaluate the existing locations within the Western Council of Governments region experiencing the highest number or rate of pedestrian crashes, and evaluate improvements based on criteria for raised intersections. The STEP program indicates that raised intersections can slow down vehicle traffic and generate a safer atmosphere for pedestrians.⁹ The study will provide the framework for raised intersection design projects in the future. Roadways classified as municipal roadways will be considered first.

Benefits:

- Providing written justification and data driven results for raised intersections allows for better communication with municipalities and the public.
- To establish good candidate locations for raised intersection in order to allow a smooth design and construction process and to better develop the use of these proven pedestrian safety countermeasures in Connecticut.

Additional projects to be initiated in FFY2022 in each Program Area are listed below. Additional details of these ongoing projects are located in the Highway Safety Improvement Program Implementation Plan for FFY2021.

Roadway Departure Projects

Horizontal Alignment Signing

The Horizontal Alignment Signing Project will implement construction on state roads in Districts 1 and 2 in FFY2022 as a result of the completion of design and advertisement efforts initiated in FFY2021. The design of horizontal curve signing on municipal roads will continue through FFY2022 as a result of the PE phase completed in FFY2021.

High Friction Surface Treatments (HFST)

Design and construction for High Friction Surface treatment on state roads is planned for FFY2022 as a result of the completion of the PE phases in each district in FFY2021.

Intersection Projects

Traffic Signal Improvements

Traffic signal safety improvements will be implemented on state roads as a result of the PE and advertising efforts in FFY2021.

Signing and Pavement Markings at Unsignalized Intersections

Design for signing and pavement markings at unsignalized intersections will be continued on state roadways and initiated on municipal roadways as a result of design efforts in FFY2021.

Intersection Improvements

Intersection improvements will be implemented at spot locations on both state and municipal roadways as a result of design phases performed in FFY2021.

Pedestrian

Rectangular Rapid Flash Beacons (RRFB)

Design on both state and municipal roads will be continued from planning and design efforts initiated in FFY2021.

Pedestrian Improvements at Signalized Intersections

Pedestrian Improvements will be continued at the design level for state-owned and maintained traffic signals as a result of planning projects implemented in FFY2021.

Appendix A

Project List

The project list below outlines proposed and ongoing projects from the HSIP IP FFY2021. The FFY2021 projects are progressing in planning, design, and implementation as a result of FFY2021 funding and associated obligations are included in the FFY 2022 plan.

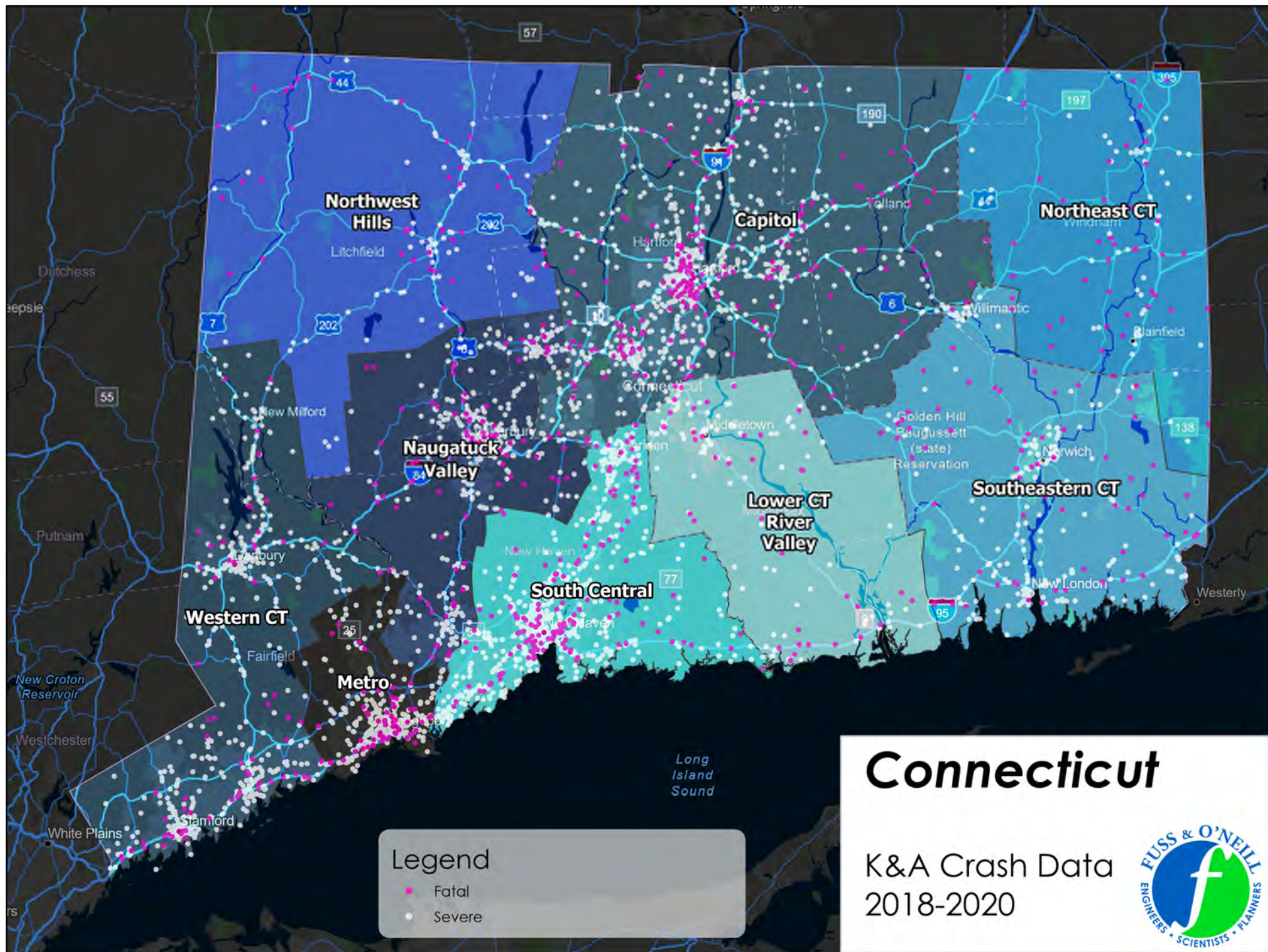
Project List for HSIP Implementation for FFY 2022 (last revised 8/30/21)											
PROJECT	PHASE	ROUTE	TOWN	DESCRIPTION	TOTAL COST	FEDERAL SHARE	Program	Improvement Type	SHSP Emphasis Area	Roadway Ownership	systemic/spot
Intersection Projects											
New HSIP IP Phases to be Obligated in FFY2022											
TBD	PL	Various	Various	Roundabout Study	2,400,000	2,160,000		intersection	intersection geometry	critical roadway locations	state/local systematic
TBD	PD	Various	Various	signing/stripping @ unsignalized locations - Muni Roads	1,000,000	1,000,000		intersection	Intersection Traffic Control	critical roadway locations	local systemic
Project Phases to be Obligated in FFY2022 (From Previous HSIP IP FFY2021)											
0092-0681	RW	CT 10	NEW HAVEN	Intersect. Imprvmt at SR745 & Kimberly Ave	250,000	225,000		intersection	intersection geometry	critical roadway locations	state systemic
0092-0681	FD	CT 10	NEW HAVEN	Intersect. Imprvmt at SR745 & Kimberly Ave (FD)	675,000	607,500		intersection	intersection geometry	critical roadway locations	state spot
0172-0484	CN	Various	DISTRICT 2	Traffic Signal Safety Improvements (Proj. #1)	2,290,000	2,290,000		intersection	Intersection Traffic Control	critical roadway locations	state systemic
0172-0485	CN	Various	DISTRICT 2	Traffic Signal Safety Improvements (Proj. #2)	2,310,000	2,310,000		intersection	Intersection Traffic Control	critical roadway locations	state systemic
0076-0224	CN	Various	MANCHESTER	Int. Improvs. @ Tolland Tpk, Buckland, Adams	1,850,000	1,665,000		intersection	intersection geometry	critical roadway locations	local spot
0102-0359	CN	Highland Avenue	NORWALK	Intersection Improvements at Flax Hill Road	448,700	403,830		intersection	intersection geometry	critical roadway locations	local spot
0173-0500	RW	Various	DISTRICT 3	Traffic Signal Safety Imprvs. - Proj. #1	70,000	70,000		intersection	Intersection Traffic Control	critical roadway locations	state systemic
0173-0500	FD	Various	DISTRICT 3	Traffic Signal Safety Imprvs. - Proj. #1 (FD)	575,000	575,000		intersection	Intersection Traffic Control	critical roadway locations	state systemic
0102-0365	CN	West Rocks Road	NORWALK	Traffic Calming Improvs. @ Various Locations	132,300	119,070		intersection	Intersection Traffic Control	critical roadway locations	local spot
0102-0362	CN	Washington Street	NORWALK	Over-Height Vehicle Detection System at North Main/South Main Street	482,700	434,430		intersection	Intersection Traffic Control	critical roadway locations	local spot
0151-0337	CN	Walnut Street	WATERBURY	Realign Int. @ East Farm & North Walnut Streets	498,150	448,335		intersection	intersection geometry	critical roadway locations	local spot
0151-0338	CN	East Main Street	WATERBURY	Traffic Signal Revision @ Int. w/ Brass Mill Dr.	750,000	675,000		intersection	intersection geometry	critical roadway locations	local spot
0173-0501	RW	Various	DISTRICT 3	Traffic Signal Safety Imprvs. - Proj. #2	10,000	10,000		intersection	Intersection Traffic Control	critical roadway locations	state systemic
0173-0501	FD	Various	DISTRICT 3	Traffic Signal Safety Imprvs. - Proj. #2 (FD)	560,000	560,000		intersection	Intersection Traffic Control	critical roadway locations	state systemic
0172-0507	FD	Various	DISTRICT 2	Install Signs & Update Markings at Unsignalized Locations (FD)	35,000	35,000		intersection	Intersection Traffic Control	critical roadway locations	state systemic
0063-0720	CN	Asylum Avenue	HARTFORD	Intersection Improvements at Sigourney Street	922,220	829,998		intersection	Intersection geometry	critical roadway locations	local spot
0171-0462	PD	Various	DISTRICT 1	Traffic Signal Safety Improvements (Project #1) (PD)	682,500	682,500		intersection	Intersection Traffic Control	critical roadway locations	state systemic
0174-0449	FD	Various	DISTRICT 4	Install Signs & Update Markings at Unsignalized Locations (FD)	95,000	95,000		intersection	Intersection Traffic Control	critical roadway locations	state systemic
0171-0463	PD	Various	DISTRICT 1	Traffic Signal Safety Improvements (Project #2) (PD)	699,000	699,000		intersection	Intersection Traffic Control	critical roadway locations	state systemic
0171-0470	PD	Various	DISTRICT 1	Install Signs & Update Markings at Unsignalized Locations (FD)	130,000	130,000		intersection	Intersection Traffic Control	critical roadway locations	state systemic
0135-0342	CN	Broad Street	STAMFORD	Int. Imprvs. @ Gay St. & Greyrock St.	621,000	558,900		intersection	intersection geometry	critical roadway locations	local spot
0173-0517	FD	Various	DISTRICT 3	Install Signs & Update Markings at Unsignalized Locations (FD)	220,000	220,000		intersection	Intersection Traffic Control	critical roadway locations	state systemic
0174-0435	FD	Various	DISTRICT 4	Traffic Signal Safety Improvements (Proj #1) (FD)	425,000	425,000		intersection	Intersection Traffic Control	critical roadway locations	state systemic
0174-0435	RW	Various	DISTRICT 4	Traffic Signal Safety Improvements (Proj #1)	50,000	50,000		intersection	Intersection Traffic Control	critical roadway locations	state systemic
subtotal for intersection					18,181,570	17,278,563					
Pedestrian Projects											
New HSIP IP Phases to be Obligated in FFY2022											
TBD	PL	Various	Various	Raised Intersection Study	300,000	270,000		pedestrian	non-motorized road users	pedestrian	state/local systematic
Project Phases to be Obligated in FFY2022 (From Previous HSIP IP FFY2021)											
0171-0468	RW	Various	DISTRICT 1	Midblock Crosswalk Upgrades (RRFBs)	60,000	54,000		pedestrian	non-motorized road users	pedestrian	local systemic
0171-0468	FD	Various	DISTRICT 1	Midblock Crosswalk Upgrades (RRFBs) (FD)	292,000	262,800		pedestrian	non-motorized road users	pedestrian	local systemic
0172-0505	RW	Various	DISTRICT 2	Midblock Crosswalk Upgrades (RRFBs)	15,000	13,500		pedestrian	non-motorized road users	pedestrian	local systemic
0172-0505	FD	Various	DISTRICT 2	Midblock Crosswalk Upgrades (RRFBs) (FD)	67,000	60,300		pedestrian	non-motorized road users	pedestrian	local systemic
0173-0516	RW	Various	DISTRICT 3	Midblock Crosswalk Upgrades (RRFBs)	35,000	31,500		pedestrian	non-motorized road users	pedestrian	local systemic
0173-0516	FD	Various	DISTRICT 3	Midblock Crosswalk Upgrades (RRFBs) (FD)	183,000	164,700		pedestrian	non-motorized road users	pedestrian	local systemic
0174-0447	RW	Various	DISTRICT 4	Midblock Crosswalk Upgrades (RRFBs)	40,000	36,000		pedestrian	non-motorized road users	pedestrian	local systemic
0174-0447	FD	Various	DISTRICT 4	Midblock Crosswalk Upgrades (RRFBs) (FD)	208,000	187,200		pedestrian	non-motorized road users	pedestrian	local systemic
0173-0521	FD	Various	DISTRICT 3	Pedestrian Improvements at Signalized Intersections (FD)	127,000	127,000		pedestrian	non-motorized road users	pedestrian	state systemic
0171-0473	CN	Various	DISTRICT 1	Pedestrian Improvements at Signalized Intersections	500,000	500,000		pedestrian	non-motorized road users	pedestrian	state systemic
0172-0495	CN	Various	DISTRICT 2	Midblock Crosswalk Upgrades	1,370,000	1,233,000		pedestrian	non-motorized road users	pedestrian	state systemic
0171-0473	FD	Various	DISTRICT 1	Pedestrian Improvements at Signalized Intersections (FD)	38,000	38,000		pedestrian	non-motorized road users	pedestrian	state systemic
0172-0509	FD	Various	DISTRICT 2	Pedestrian Improvements at Signalized Intersections (FD)	45,000	45,000		pedestrian	non-motorized road users	pedestrian	state systemic
0174-0438	CN	Various	DISTRICT 4	Midblock Crosswalk Upgrades (RRFB)	1,070,000	963,000		pedestrian	non-motorized road users	pedestrian	state systemic
0173-0507	CN	Various	DISTRICT 3	Midblock Crosswalk Upgrades (RRFB)	489,000	440,100		pedestrian	non-motorized road users	pedestrian	state systemic
subtotal for pedestrian					4,839,000	4,426,100					
Roadway Departure Projects											
New HSIP IP Phases to be Obligated in FFY2022											
TBD	PL	Various	Various	Pavement Markings on Municipal Roads	500,000	450,000		roadway departure	pavement markings	critical roadway locations	local systemic
TBD	PD	Various	Various	Install High Friction Surface Treatment Throughout all Districts	700,000	630,000		roadway departure	skid resistant surface	critical roadway locations	state systemic
Project Phases to be Obligated in FFY2022 (From Previous HSIP IP FFY2021)											
0171-0440	CN	Various	DISTRICT 1	Horizontal Curve Signs & Pavement Markings	2,000,000	2,000,000		roadway departure	roadway signing	critical roadway locations	state systemic
0171-0469	CN	Various	DISTRICT 1	Install High Friction Surface Treatment at Various Locations	2,038,000	2,038,000		roadway departure	skid resistant surface	critical roadway locations	state systemic
0172-0506	CN	Various	DISTRICT 2	Install High Friction Surface Treatment at Various Locations	1,788,000	1,788,000		roadway departure	skid resistant surface	critical roadway locations	state systemic
0173-0518	FD	Various	DISTRICT 3	Install High Friction Surface Treatment at Various Locations (FD)	75,000	67,500		roadway departure	skid resistant surface	critical roadway locations	state systemic
0174-0450	FD	Various	DISTRICT 4	Install High Friction Surface Treatment at Various Locations (FD)	75,000	67,500		roadway departure	skid resistant surface	critical roadway locations	state systemic
0173-0518	CN	Various	DISTRICT 3	Install High Friction Surface Treatment at Various Locations	2,820,000	2,538,000		roadway departure	skid resistant surface	critical roadway locations	state systemic
0174-0450	CN	Various	DISTRICT 4	Install High Friction Surface Treatment at Various Locations	2,820,000	2,538,000		roadway departure	skid resistant surface	critical roadway locations	state systemic
0172-0477	CN	Various	DISTRICT 2	Horizontal Curve Signs & Pvmt. Markings	3,810,000	3,810,000		roadway departure	roadway signing	critical roadway locations	state systemic
0172-0508	FD	Various	DISTRICT 2	Install Curve Warning Signs at Various Locations (FD)	100,000	100,000		roadway departure	roadway signing	critical roadway locations	local systemic
subtotal for roadway departure					16,726,000	16,027,000					
Other HSIP projects											
Project Phases to be Obligated in FFY2022 (From Previous HSIP IP FFY2021)											
0093-0241	PL		NEWINGTON	CT Safety Research Center (7/1/21-6/30/26)	2,243,716	2,243,716				statewide	
0093-0242	PL		NEWINGTON	Highway Safety Office Tasks Consistent with SHSP (7/1/21-6/30/26)	870,820	870,820				statewide	
0170-3565	PL		STATEWIDE	CT Safety Analysis Methods (thru 9/30/25)	1,500,000	1,500,000				statewide	
subtotal for other HSIP projects					4,614,536	4,614,536					

Total 44,361,106 42,346,199

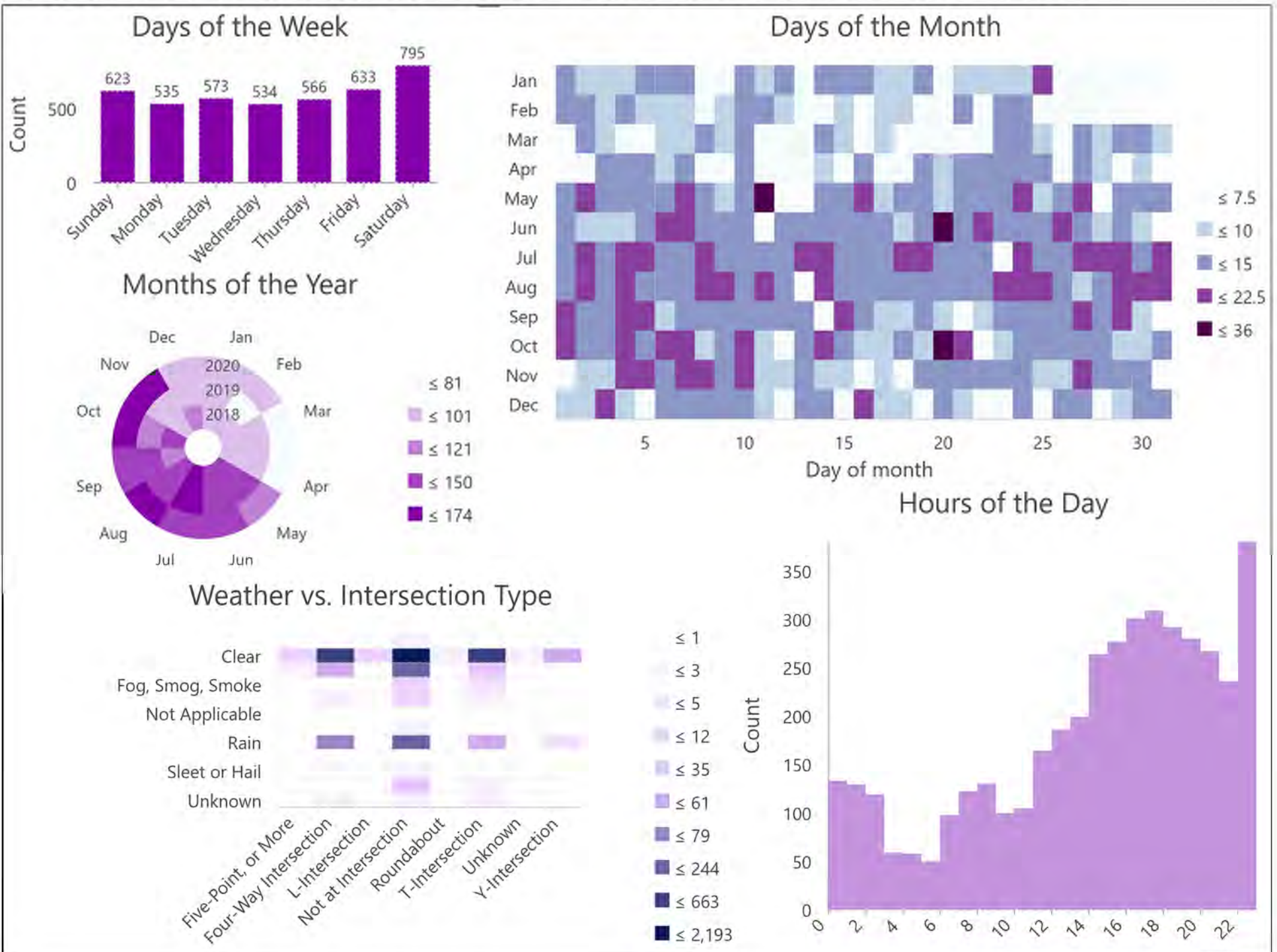
Appendix B

Statewide Crash Analysis

The analysis provided on the following pages summarizes statewide fatal and serious injury crash data from 2018-2020. The data is analyzed statewide and separated into rural and urban areas.

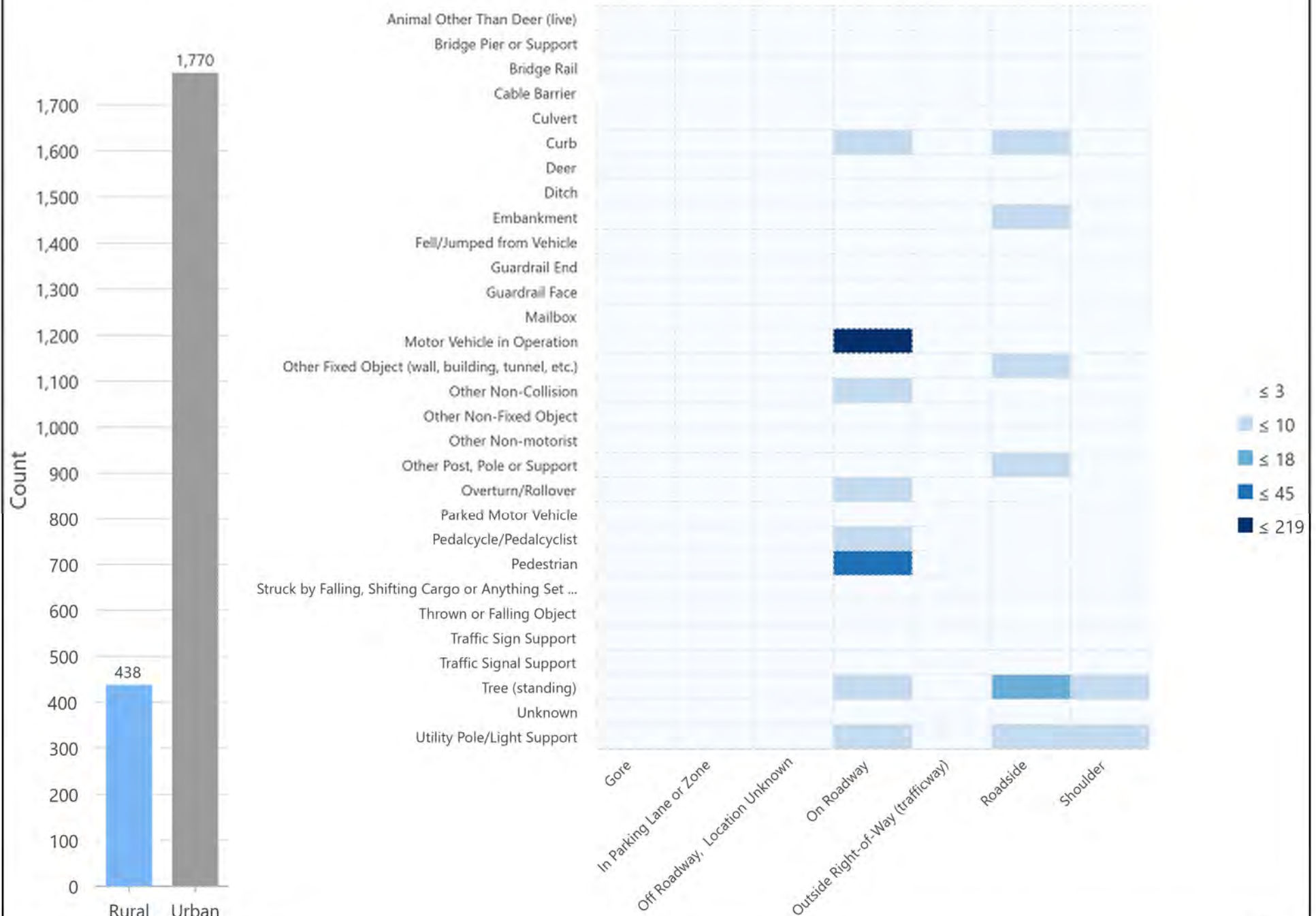


Time & Conditions K&A Crash Data 2018-2020



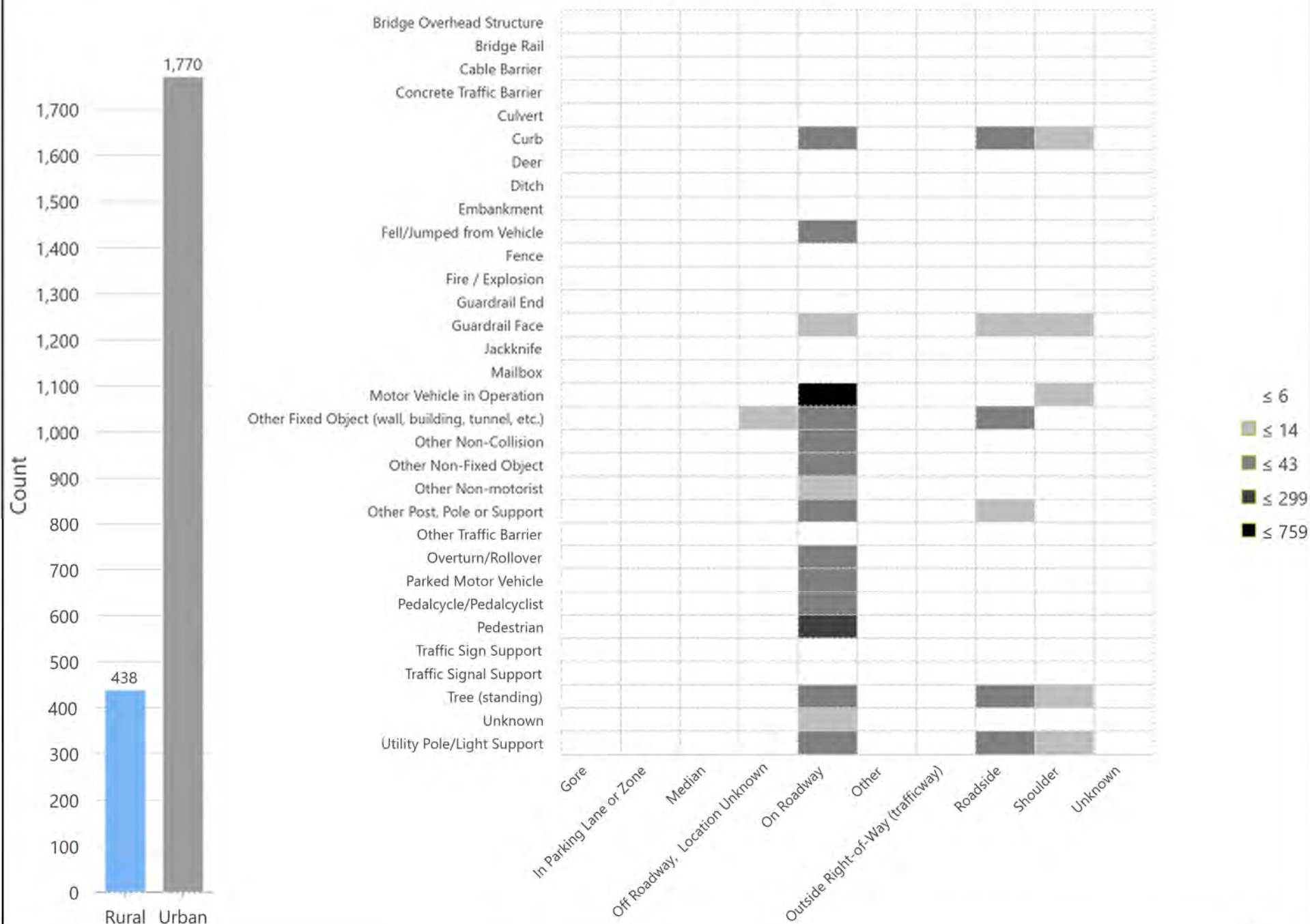
Rural vs. Urban K&A Crash Data 2018-2020

Rural - Location Type vs. Event Type



Rural vs. Urban K&A Crash Data 2018-2020

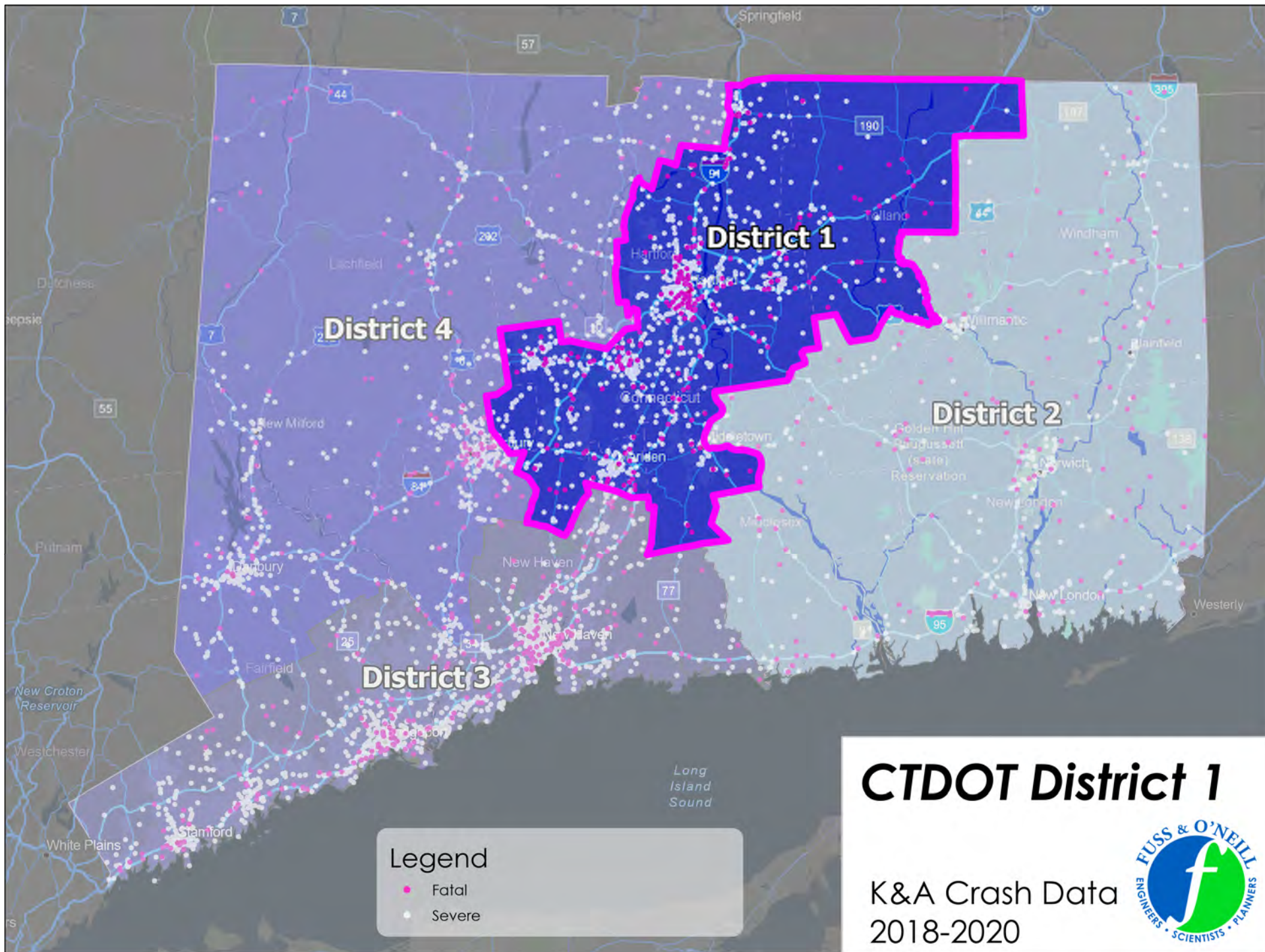
Urban - Location Type vs. Event Type



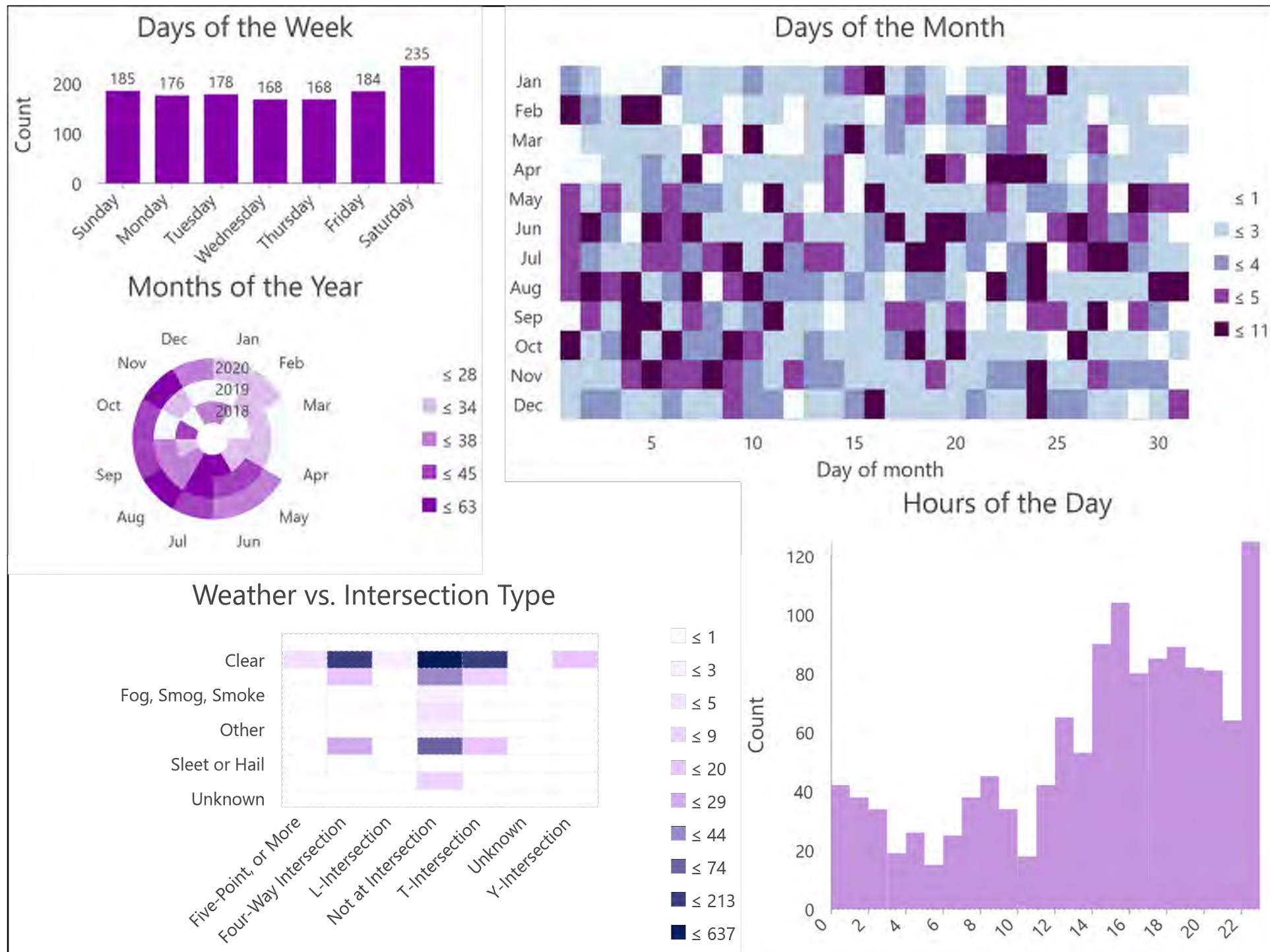
Appendix C

District Crash Analysis

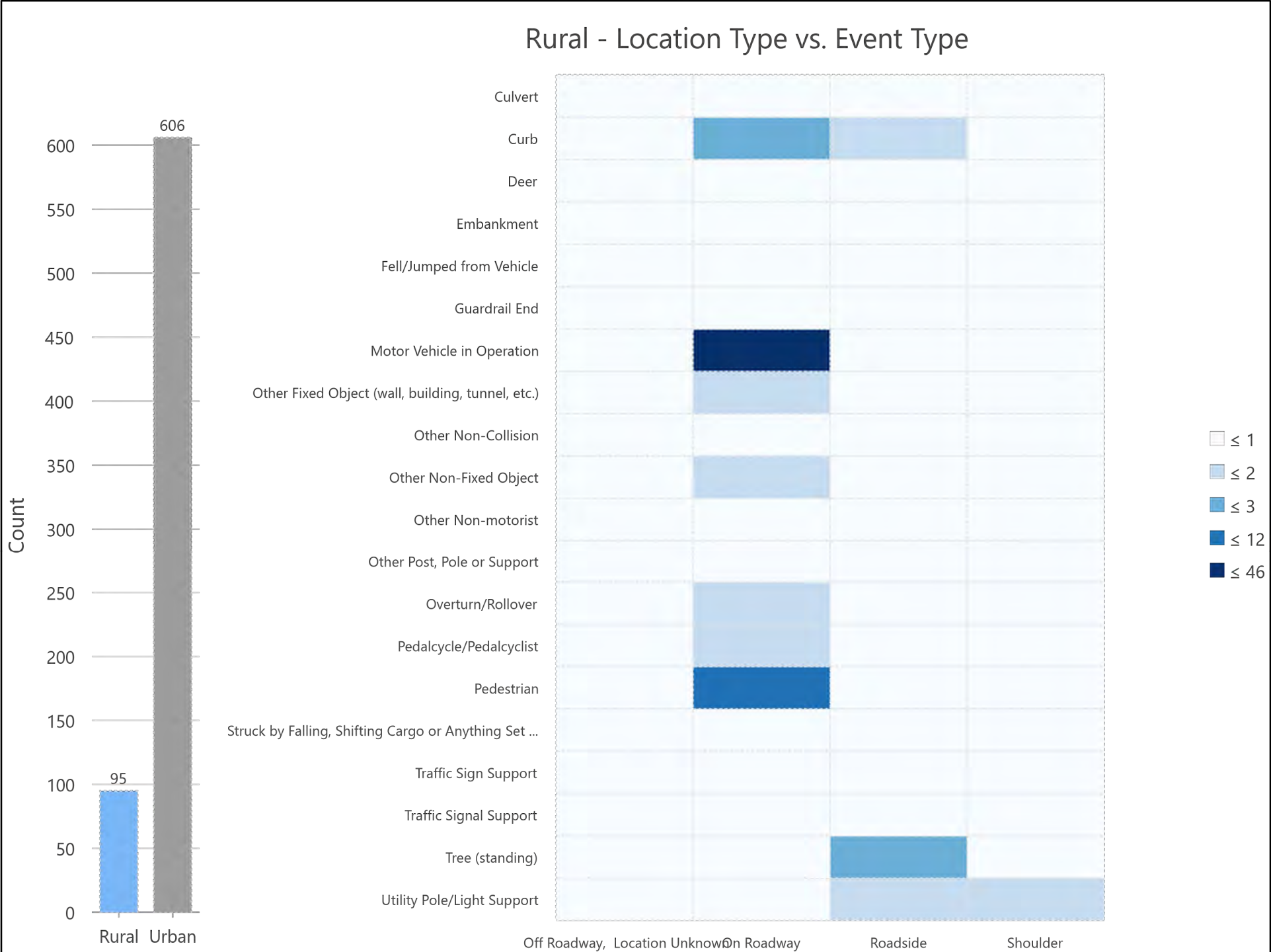
The state of Connecticut is divided into four maintenance and construction districts. The data on the following pages provides an in-depth review of the fatal and serious injury crash data for each district.



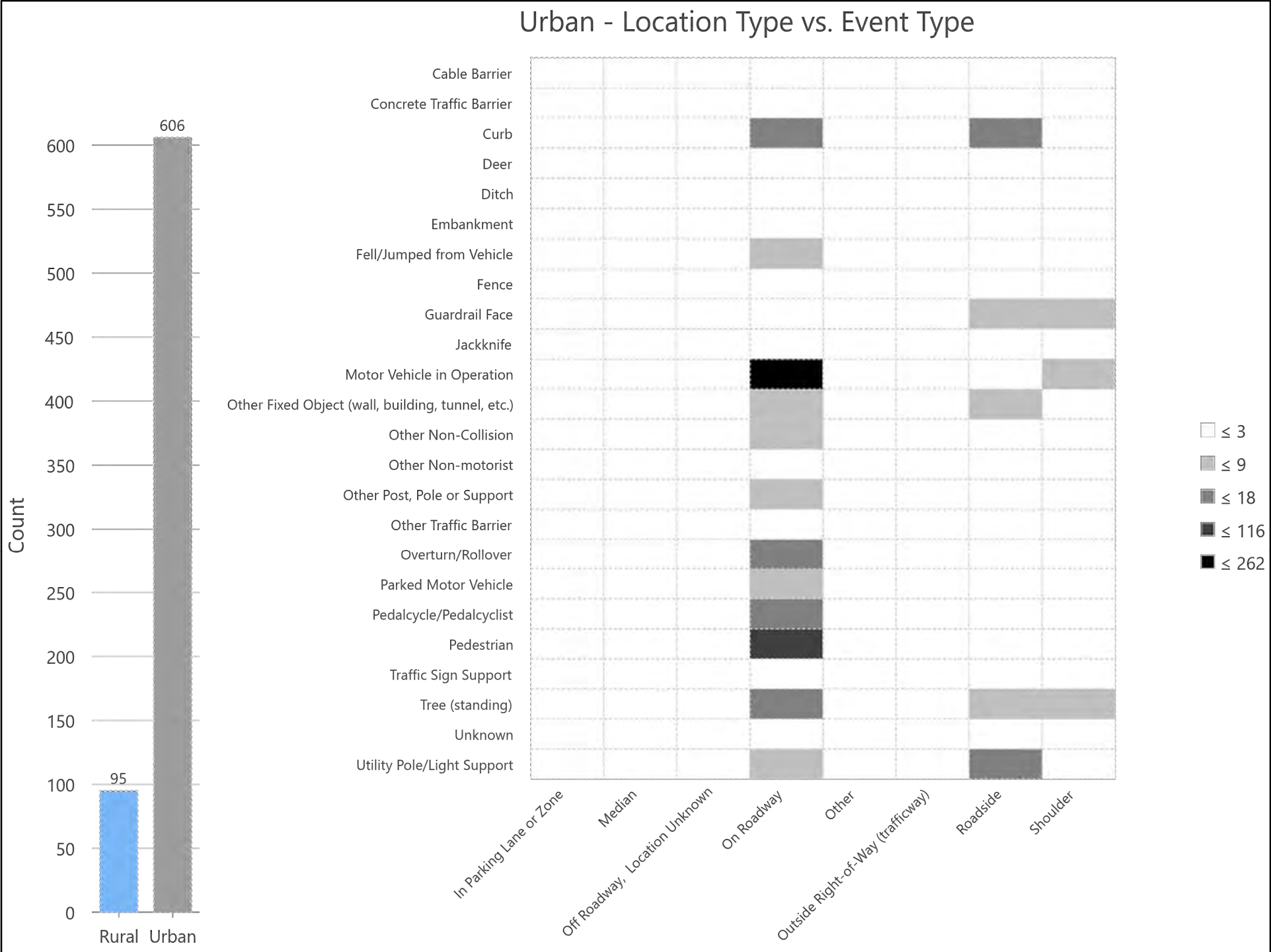
CTDOT District 1 Time & Conditions K&A Crash Data 2018-2020



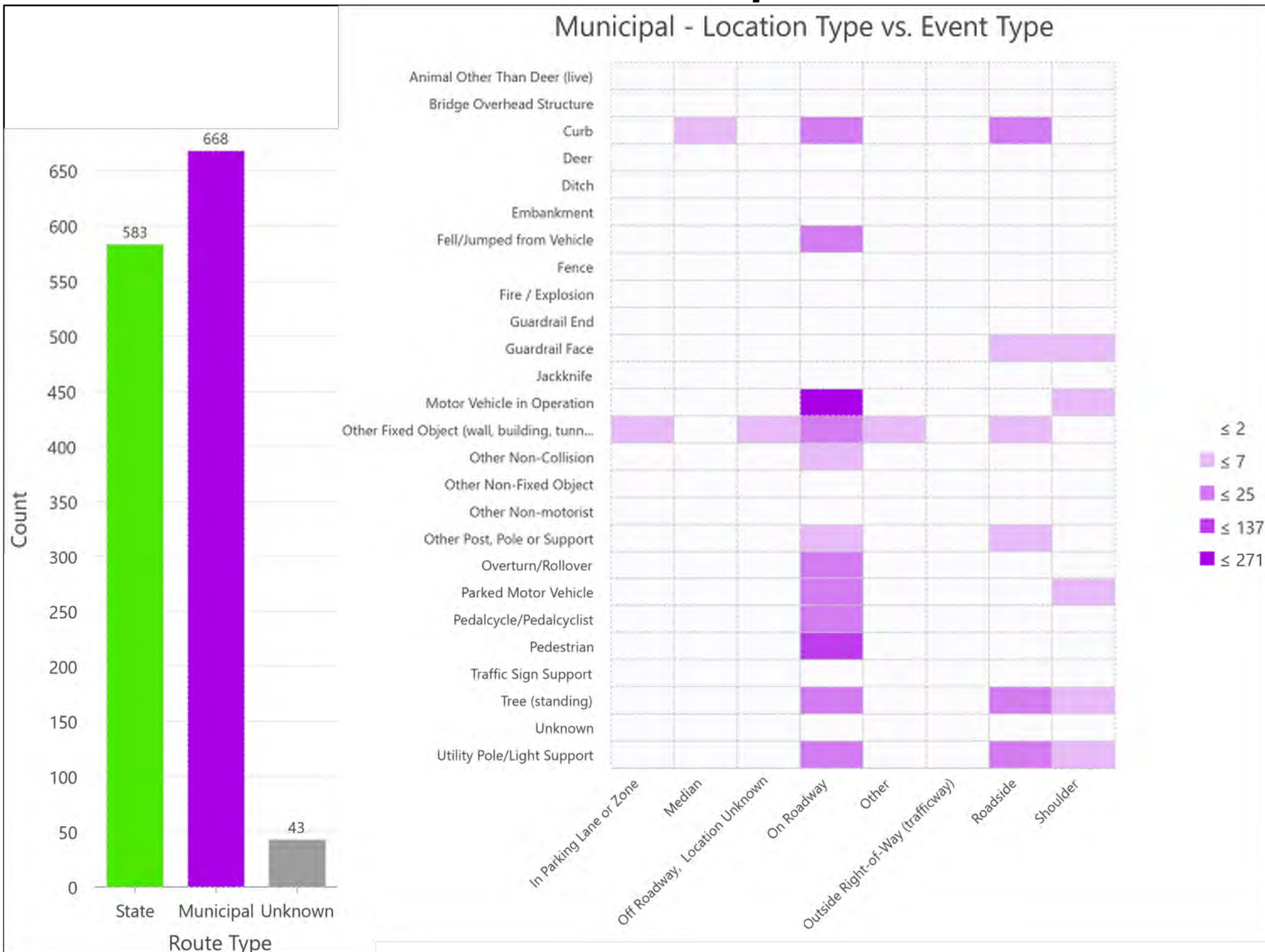
CTDOT District 1 Rural vs. Urban K&A Crash Data 2018-2020



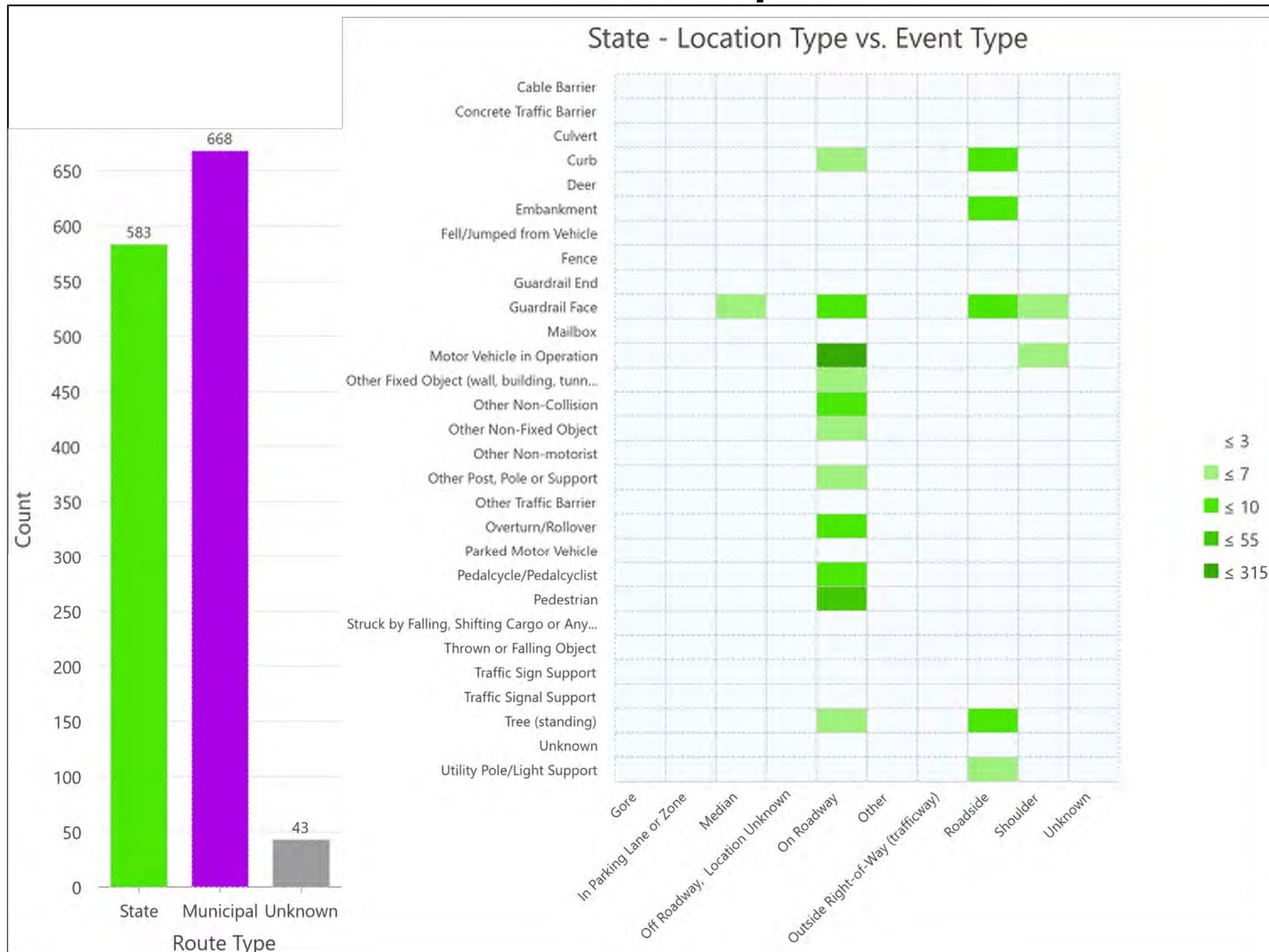
CTDOT District 1 Rural vs. Urban K&A Crash Data 2018-2020

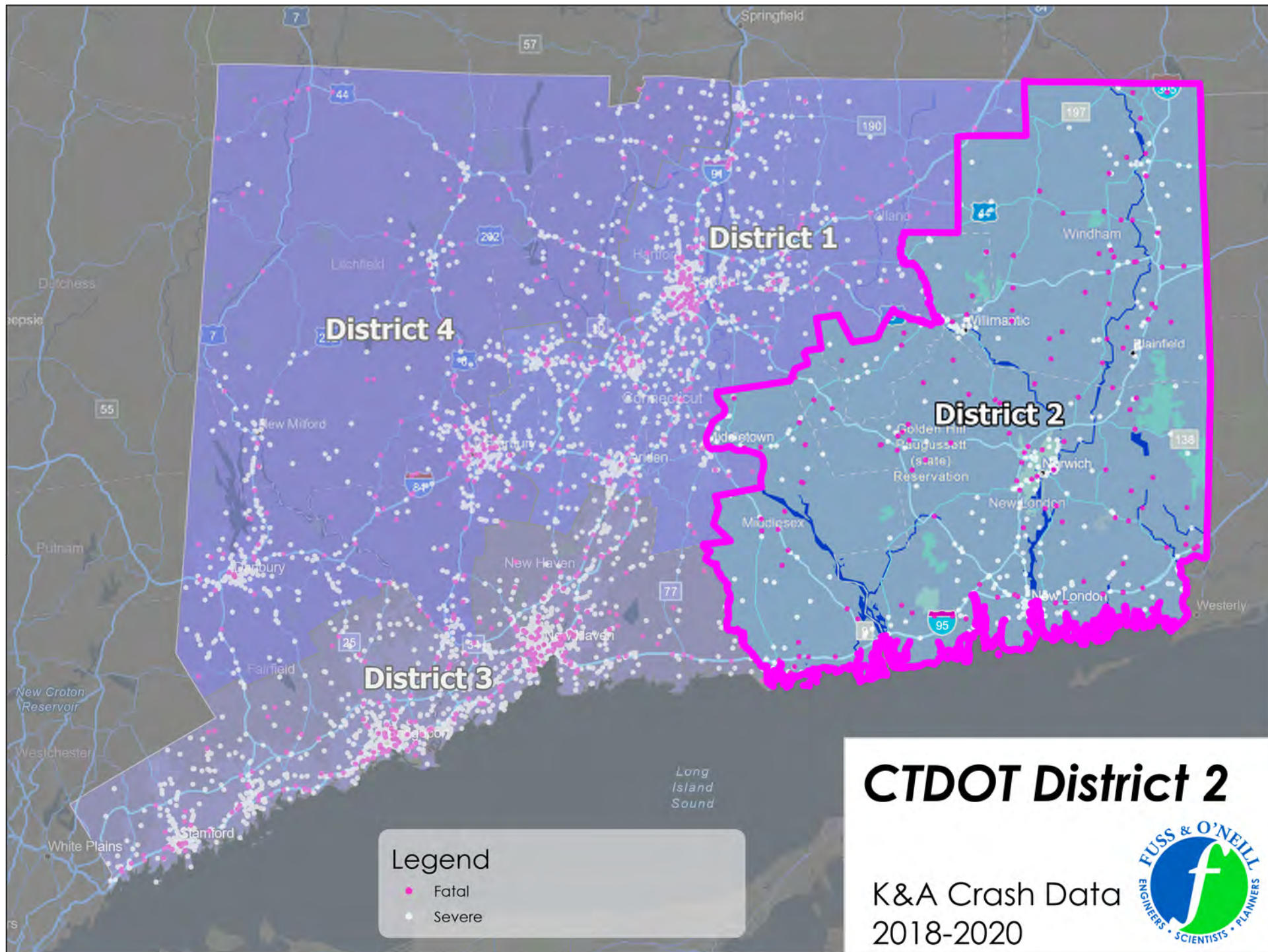


CTDOT District 1 State vs. Municipal Road

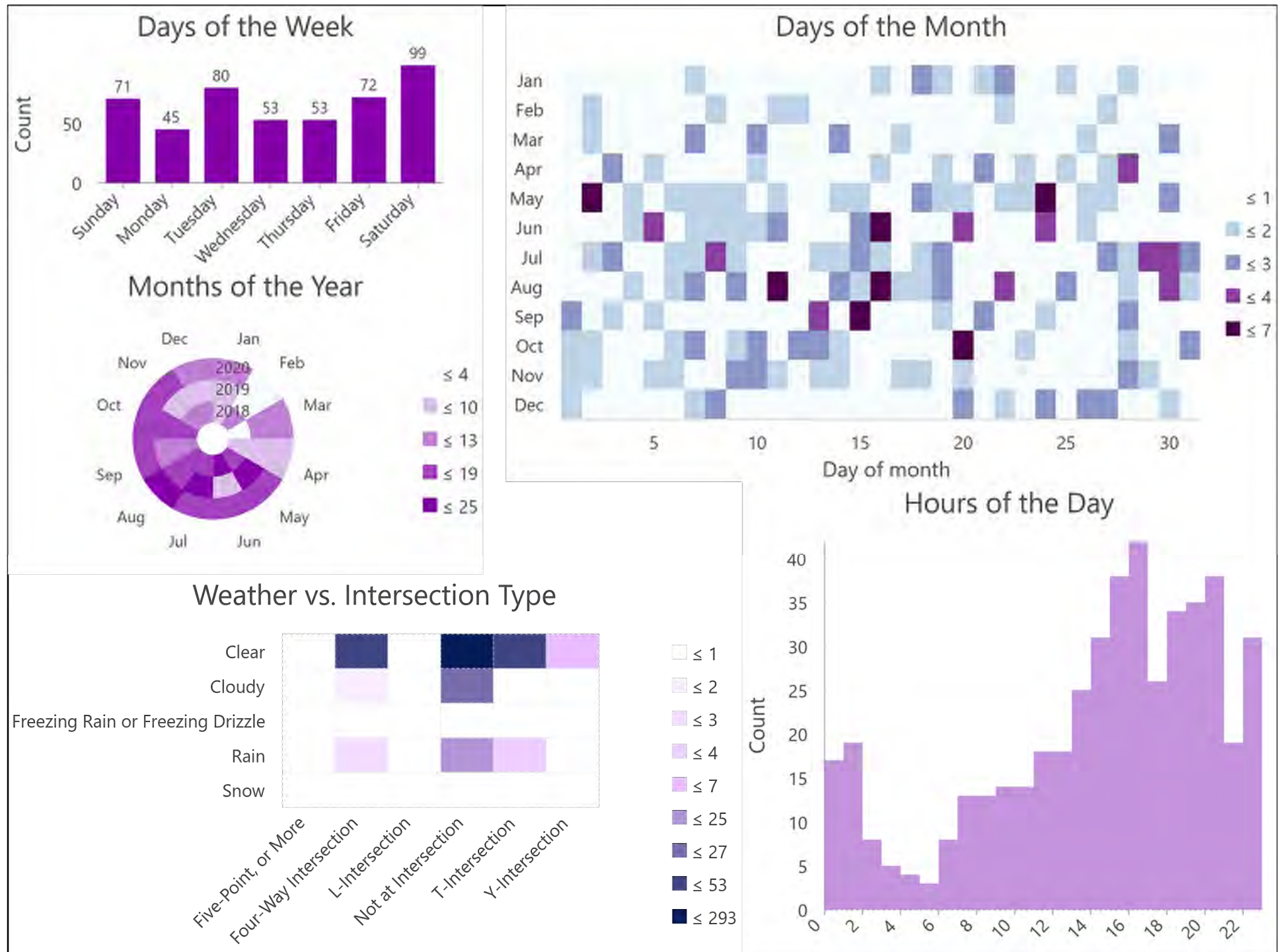


CTDOT District 1 State vs. Municipal Road





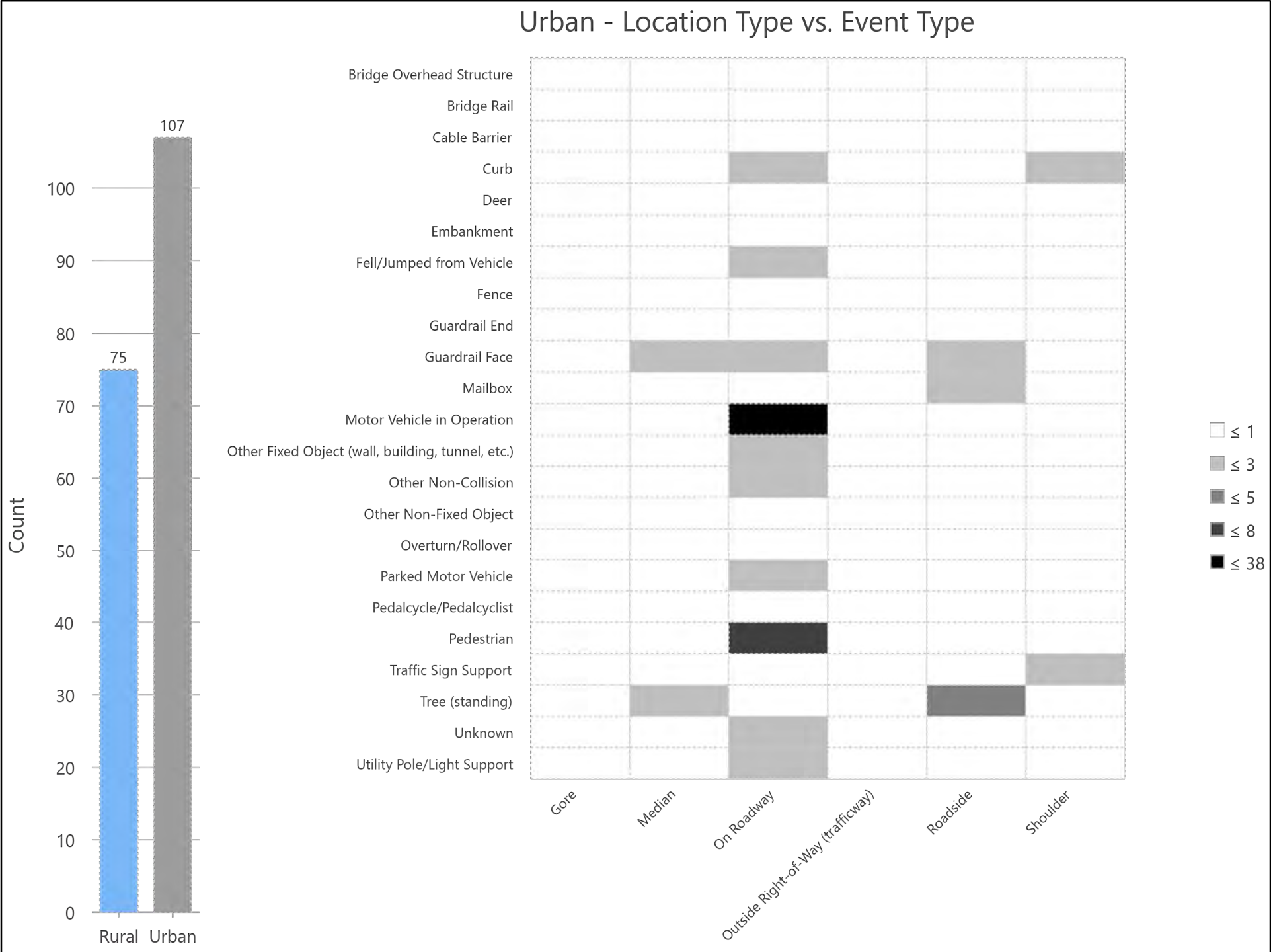
CTDOT District 2 Time & Conditions K&A Crash Data 2018-2020



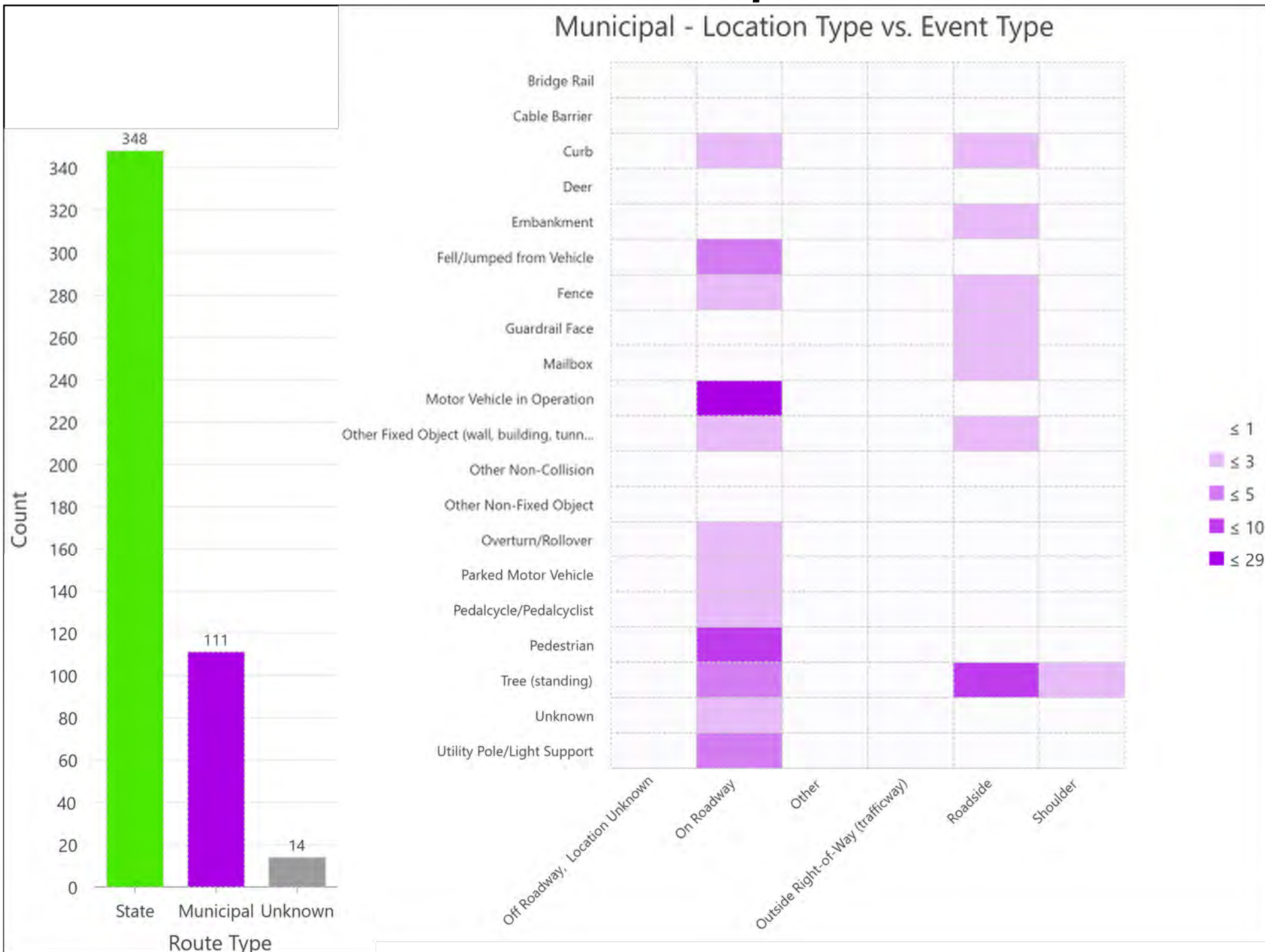
CTDOT District 2 Rural vs. Urban K&A Crash Data 2018-2020



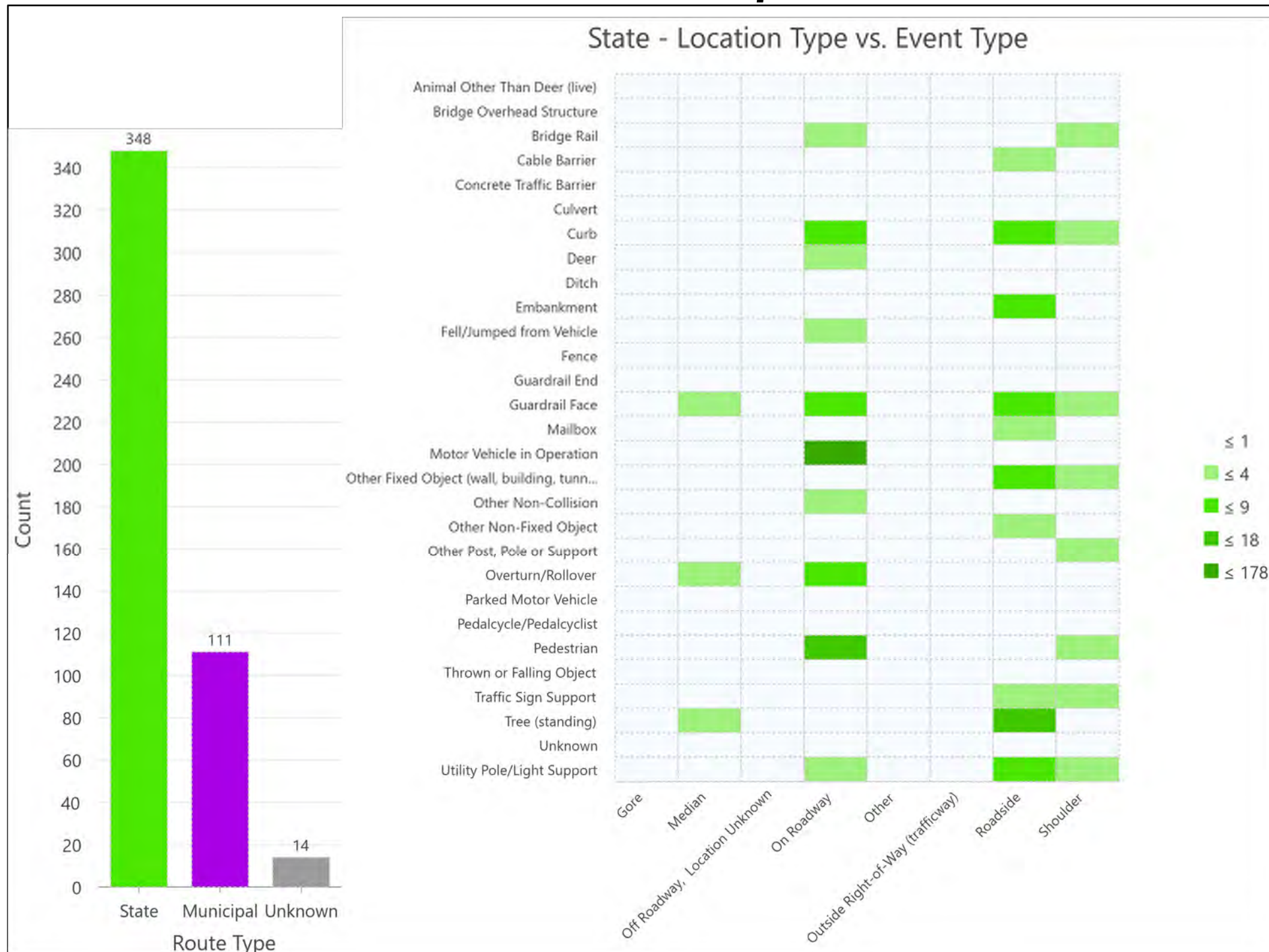
CTDOT District 2 Rural vs. Urban K&A Crash Data 2018-2020

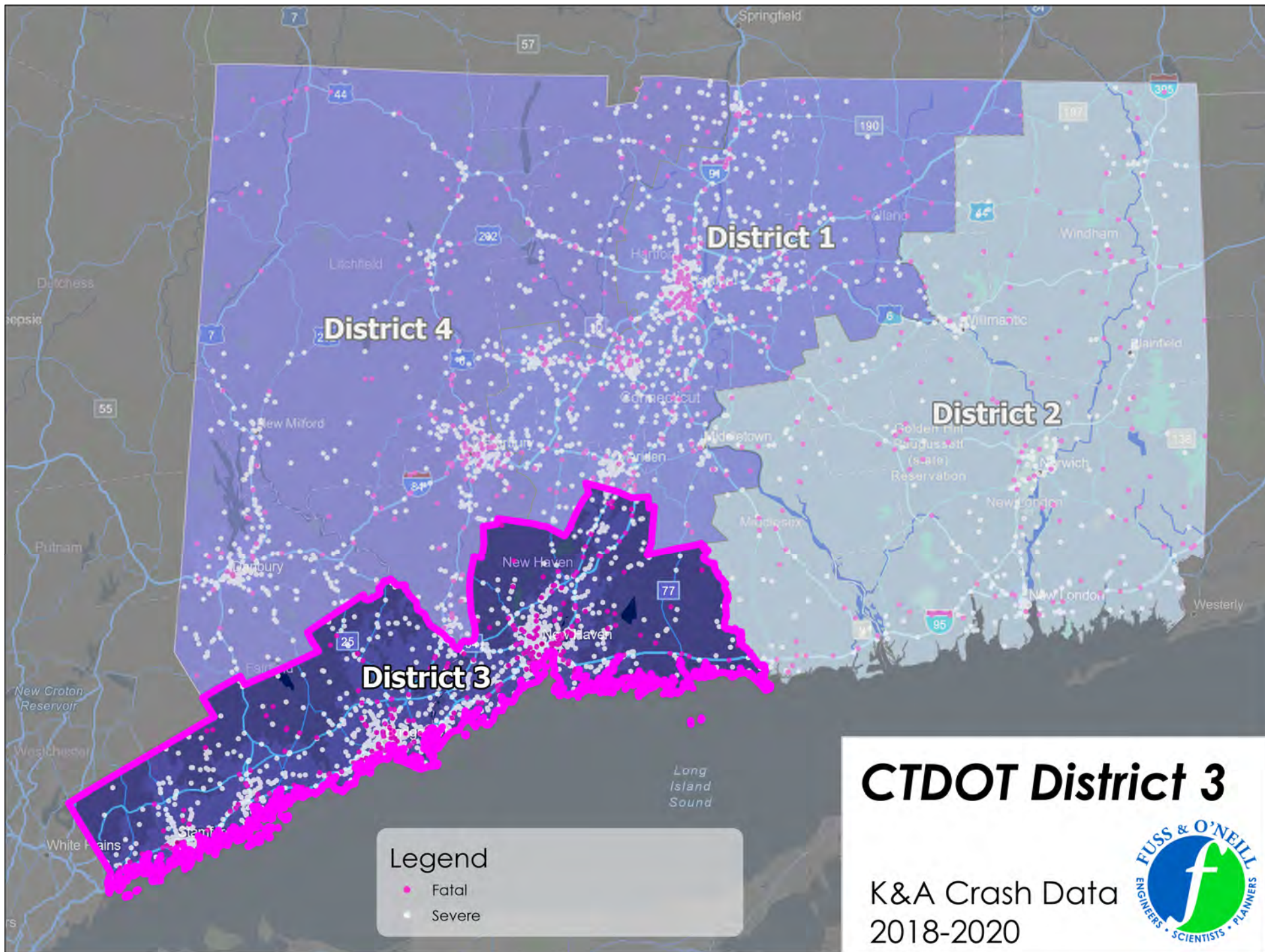


CTDOT District 2 State vs. Municipal Road

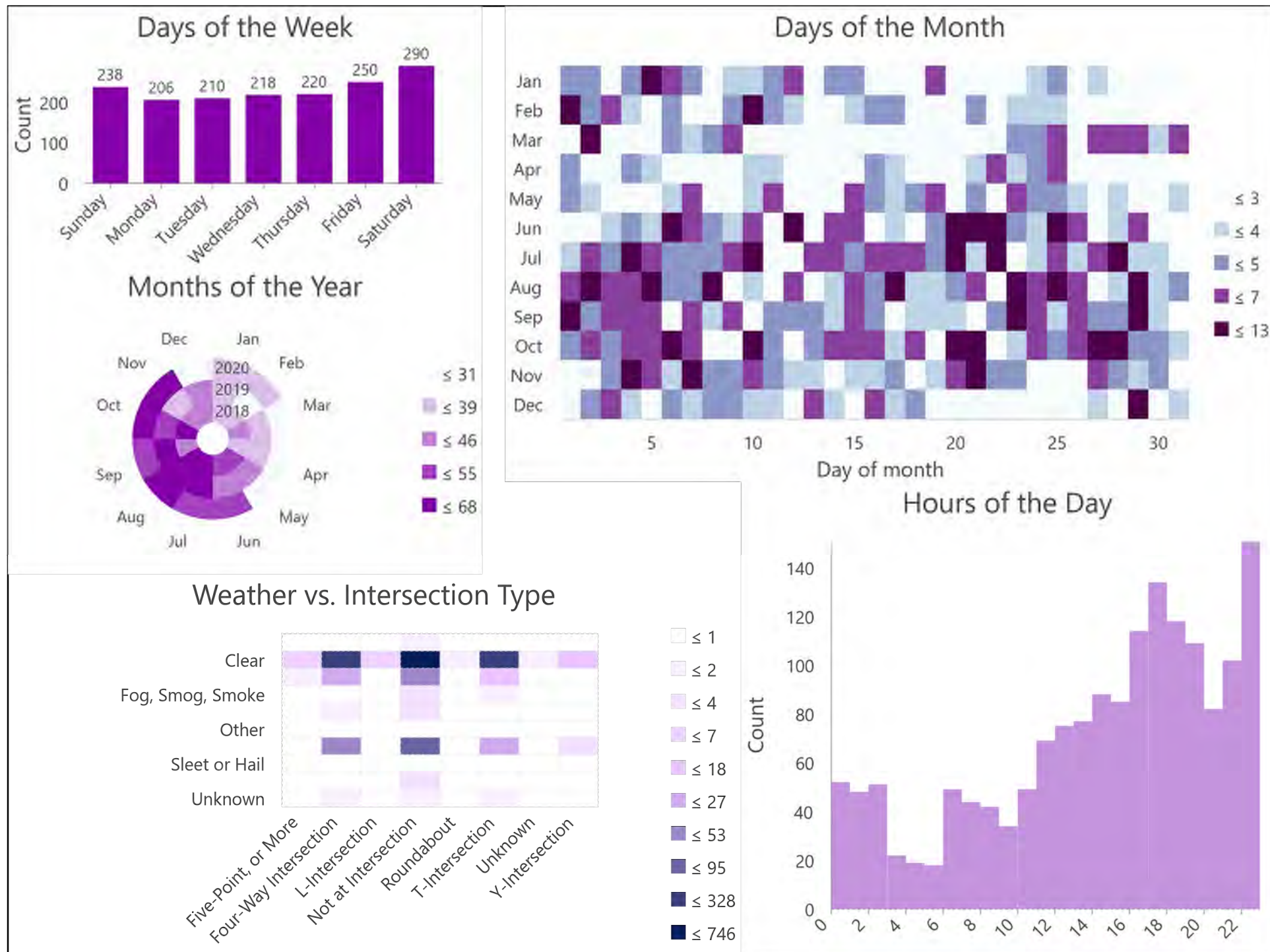


CTDOT District 2 State vs. Municipal Road





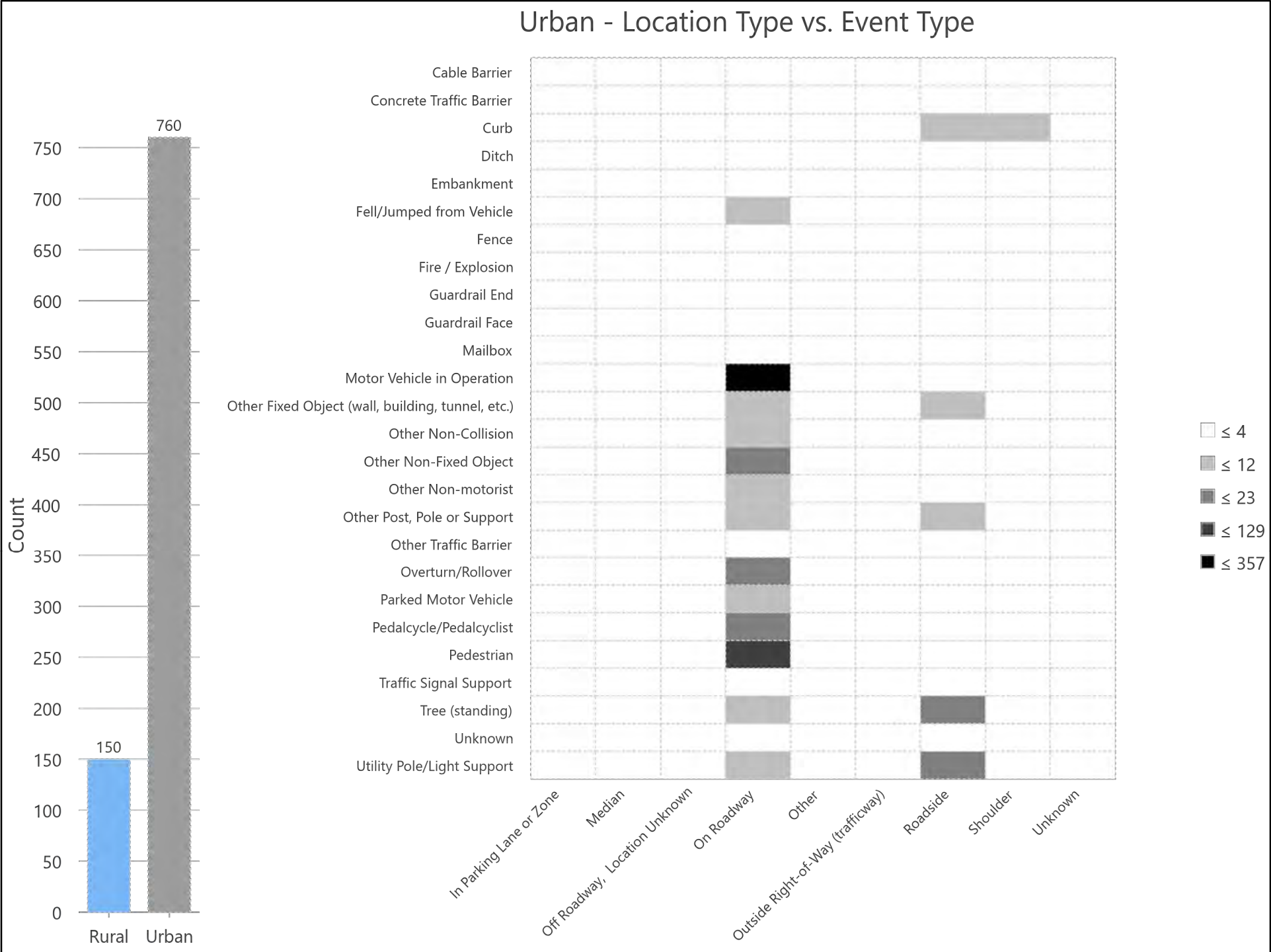
CTDOT District 3 Time & Conditions K&A Crash Data 2018-2020



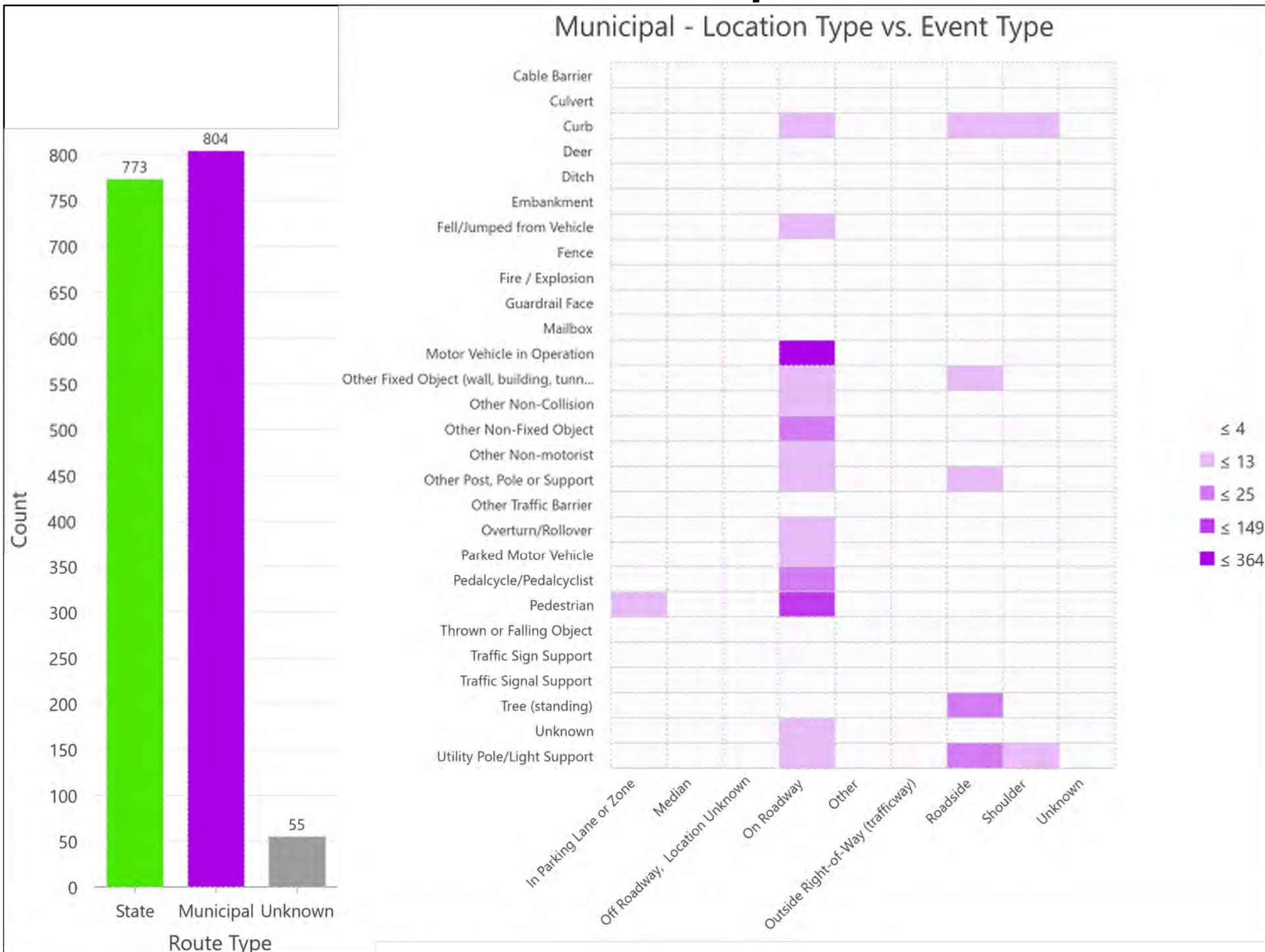
CTDOT District 3 Rural vs. Urban K&A Crash Data 2018-2020



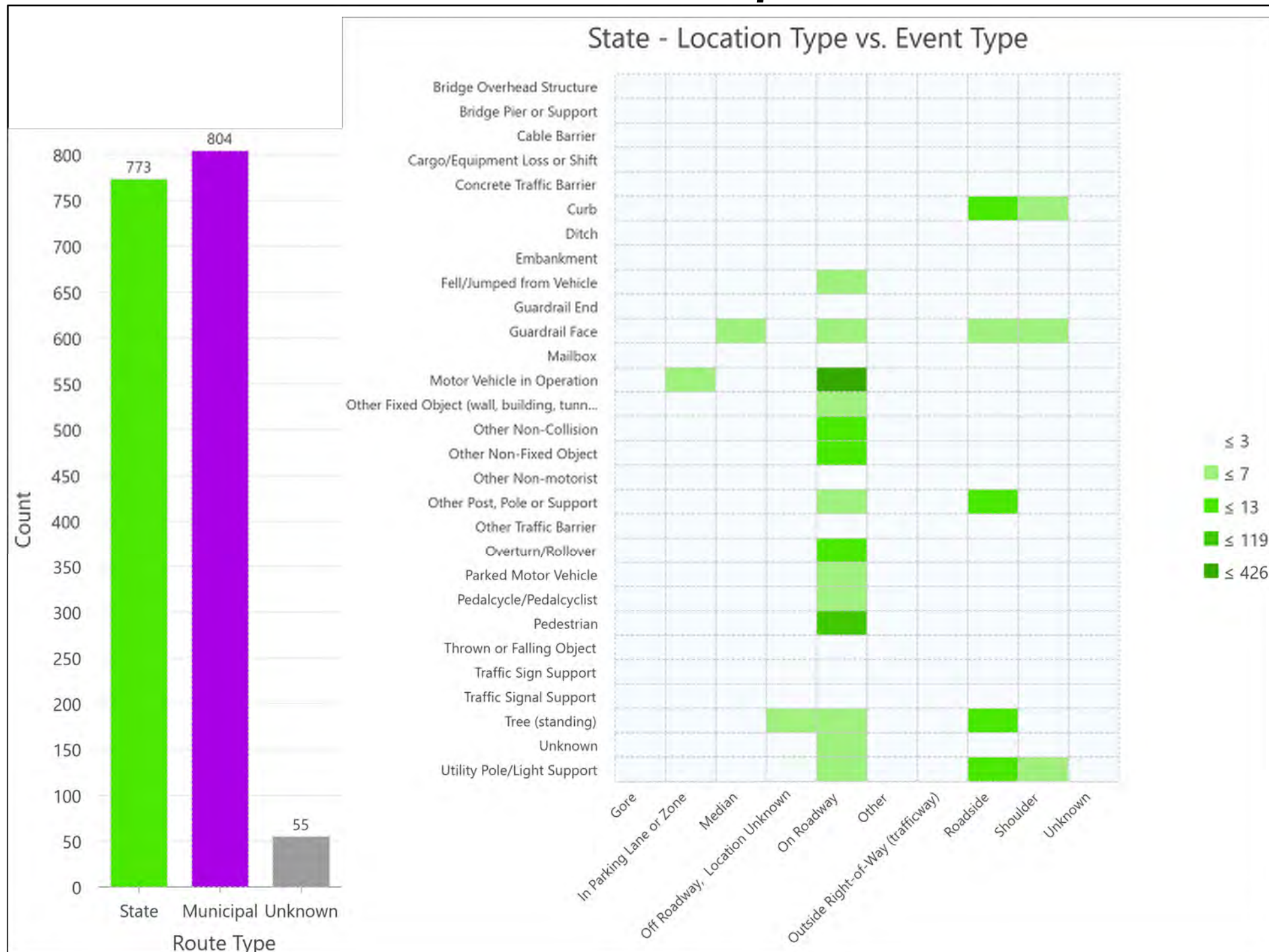
CTDOT District 3 Rural vs. Urban K&A Crash Data 2018-2020

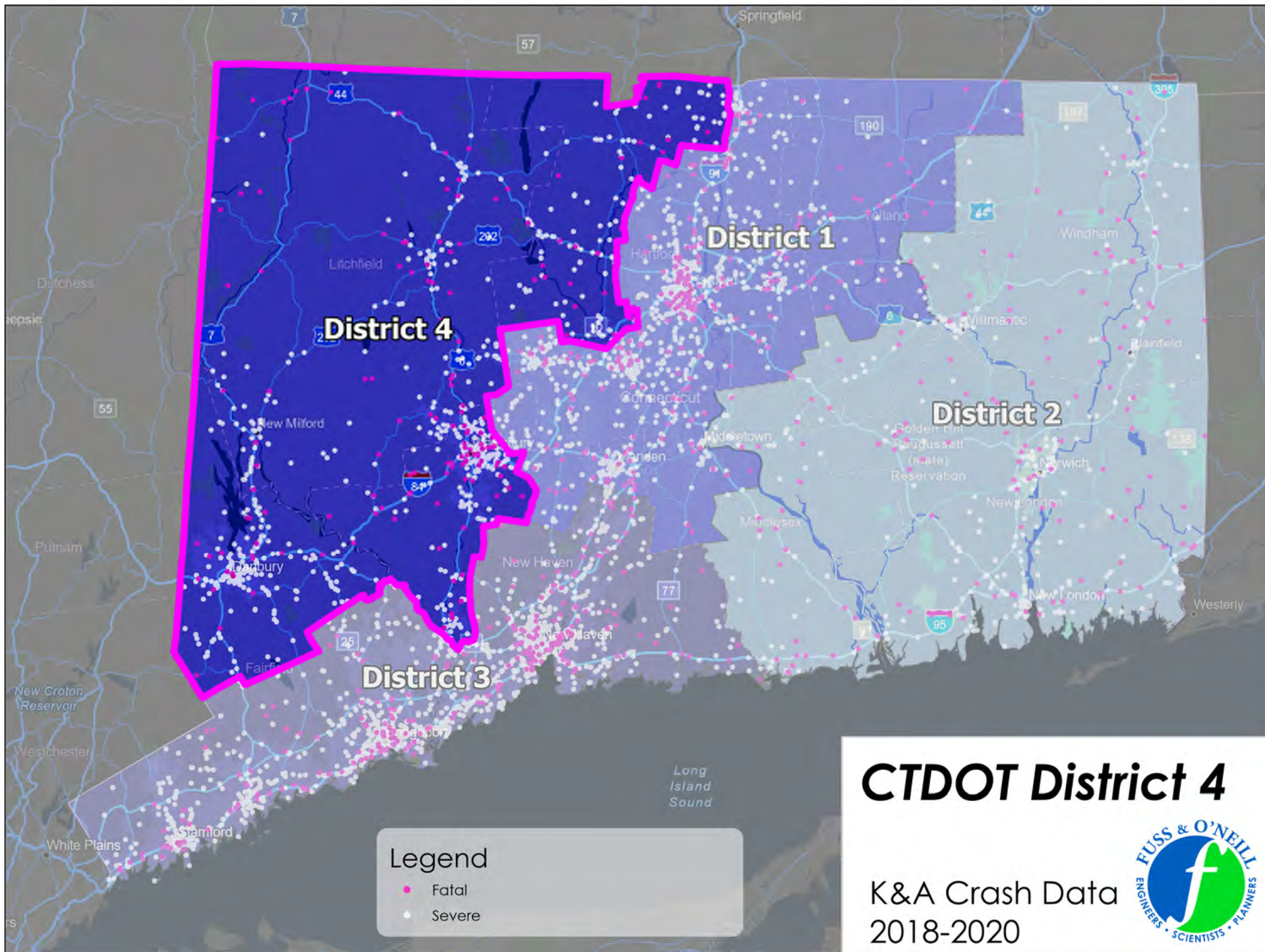


CTDOT District 3 State vs. Municipal Road

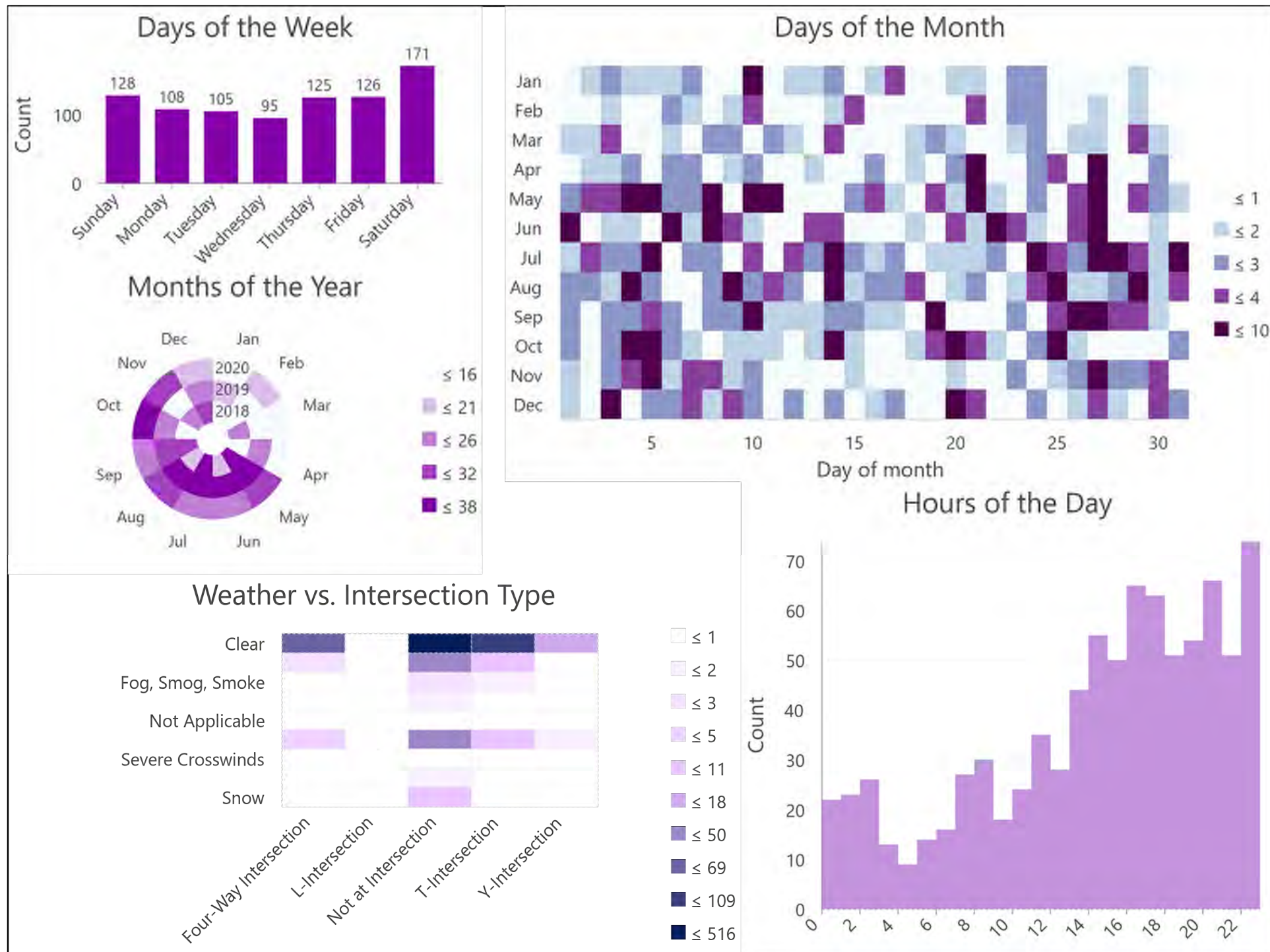


CTDOT District 3 State vs. Municipal Road



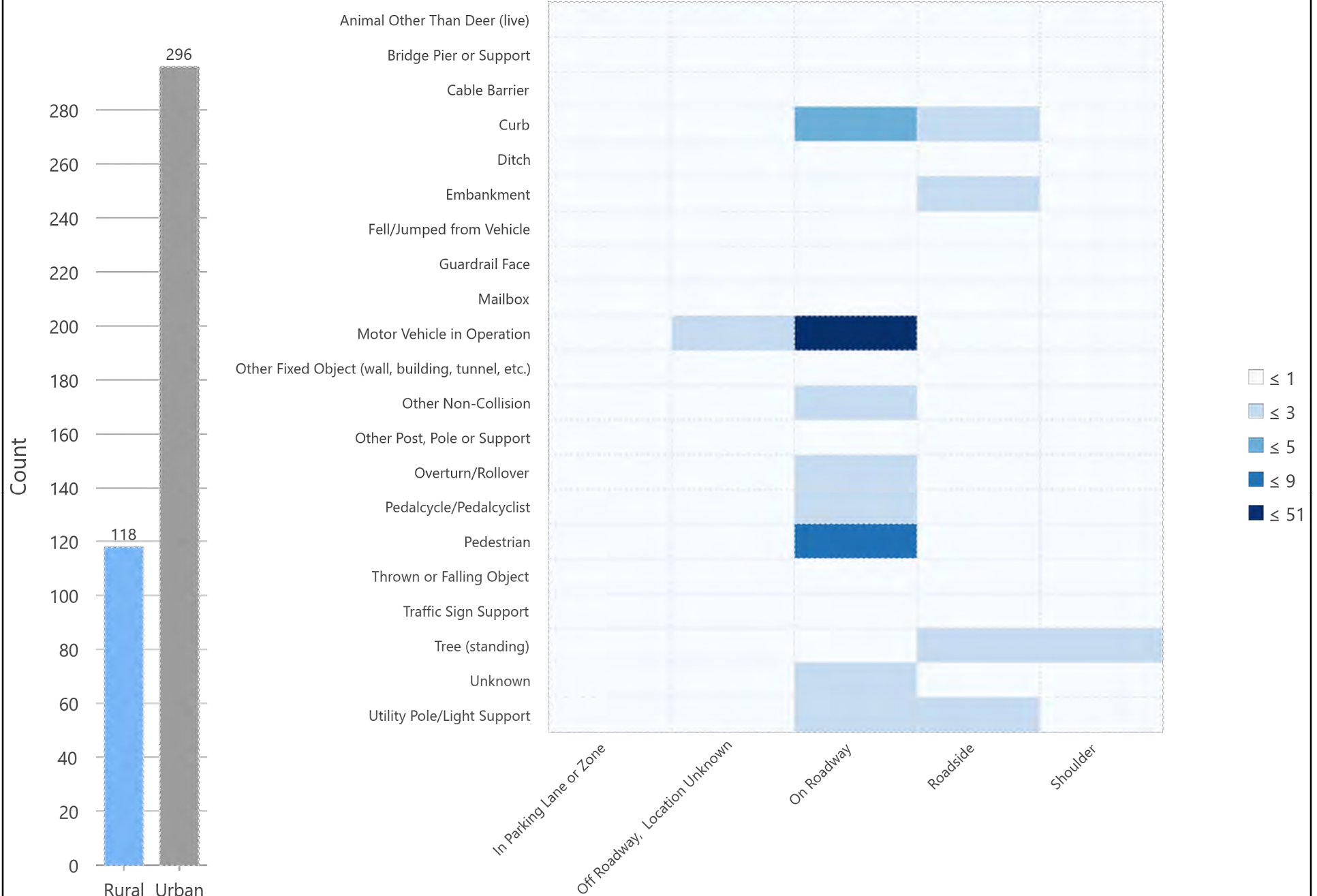


CTDOT District 4 Time & Conditions K&A Crash Data 2018-2020



CTDOT District 4 Rural vs. Urban K&A Crash Data 2018-2020

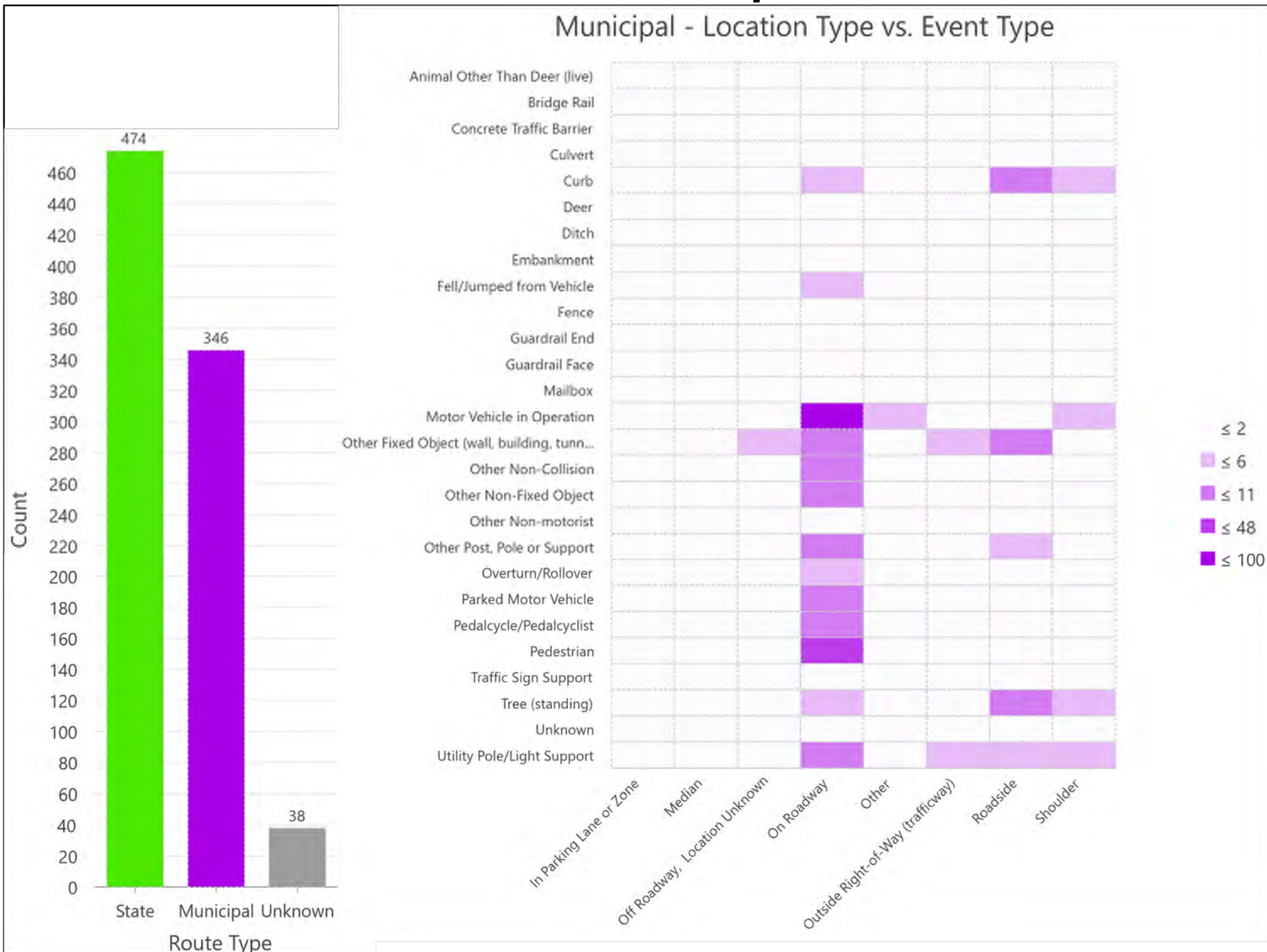
Rural - Location Type vs. Event Type



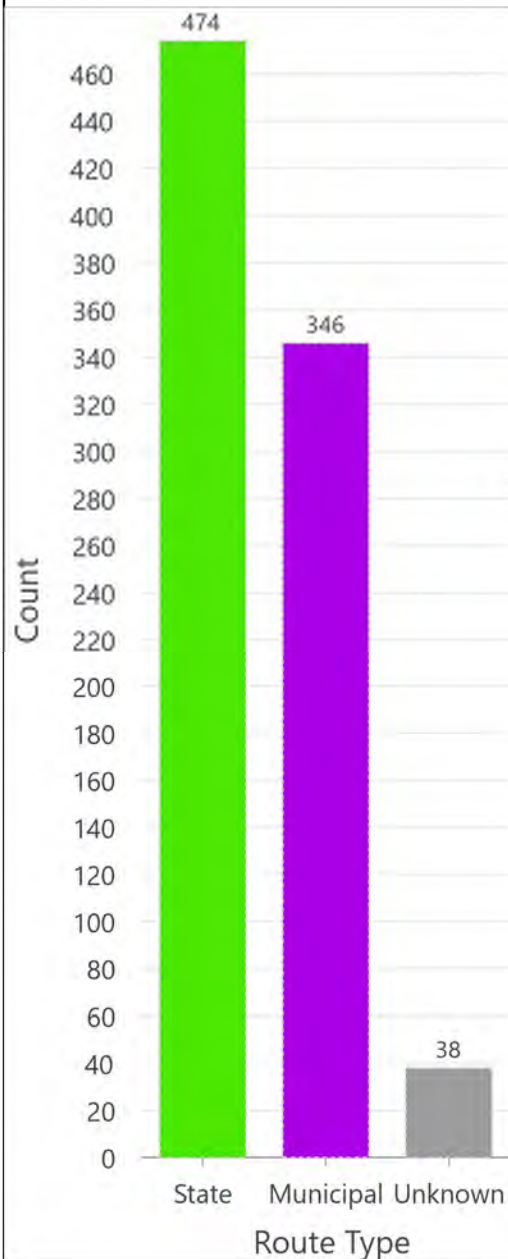
CTDOT District 4 Rural vs. Urban K&A Crash Data 2018-2020



CTDOT District 4 State vs. Municipal Road



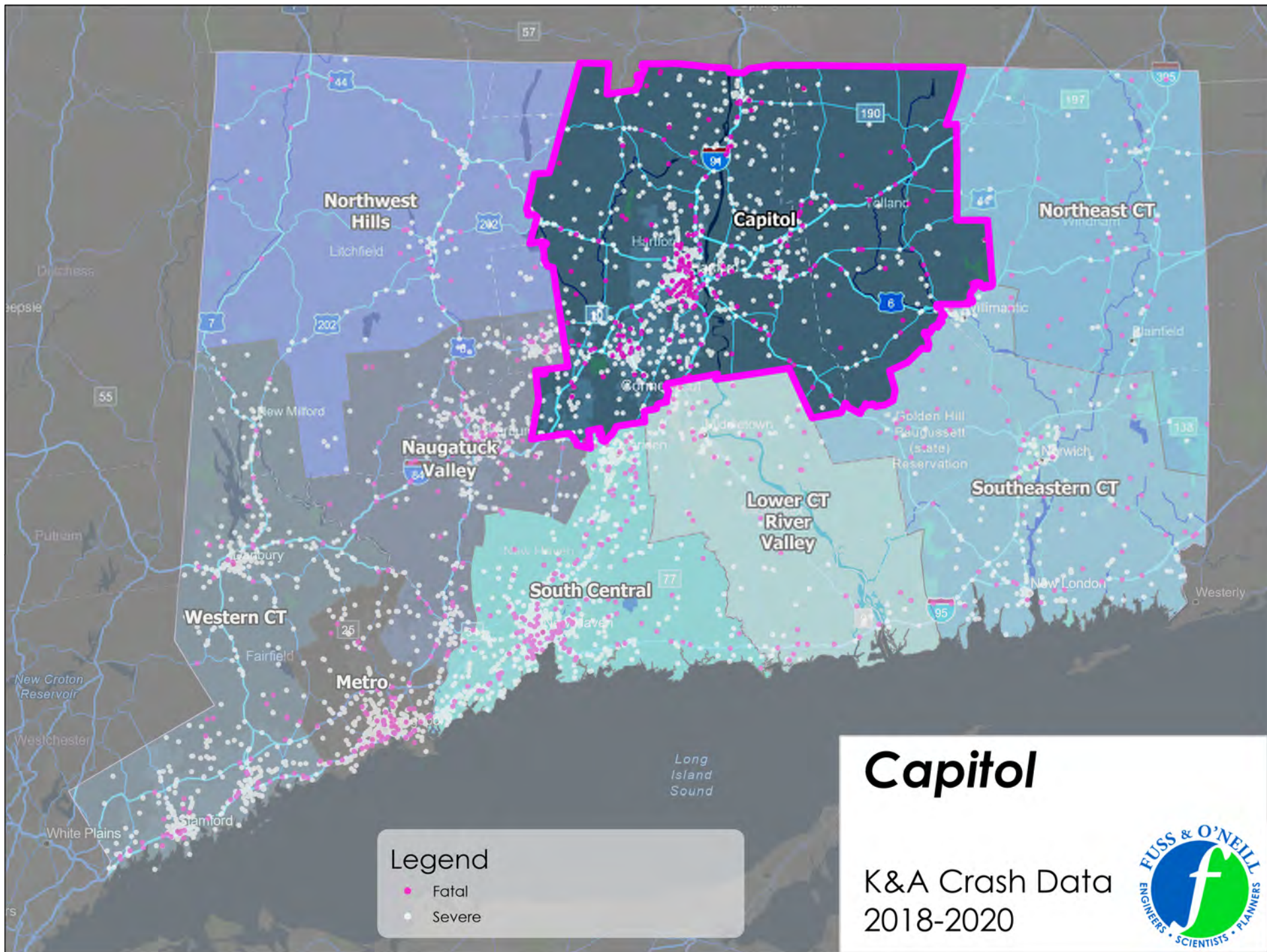
CTDOT District 4 State vs. Municipal Road



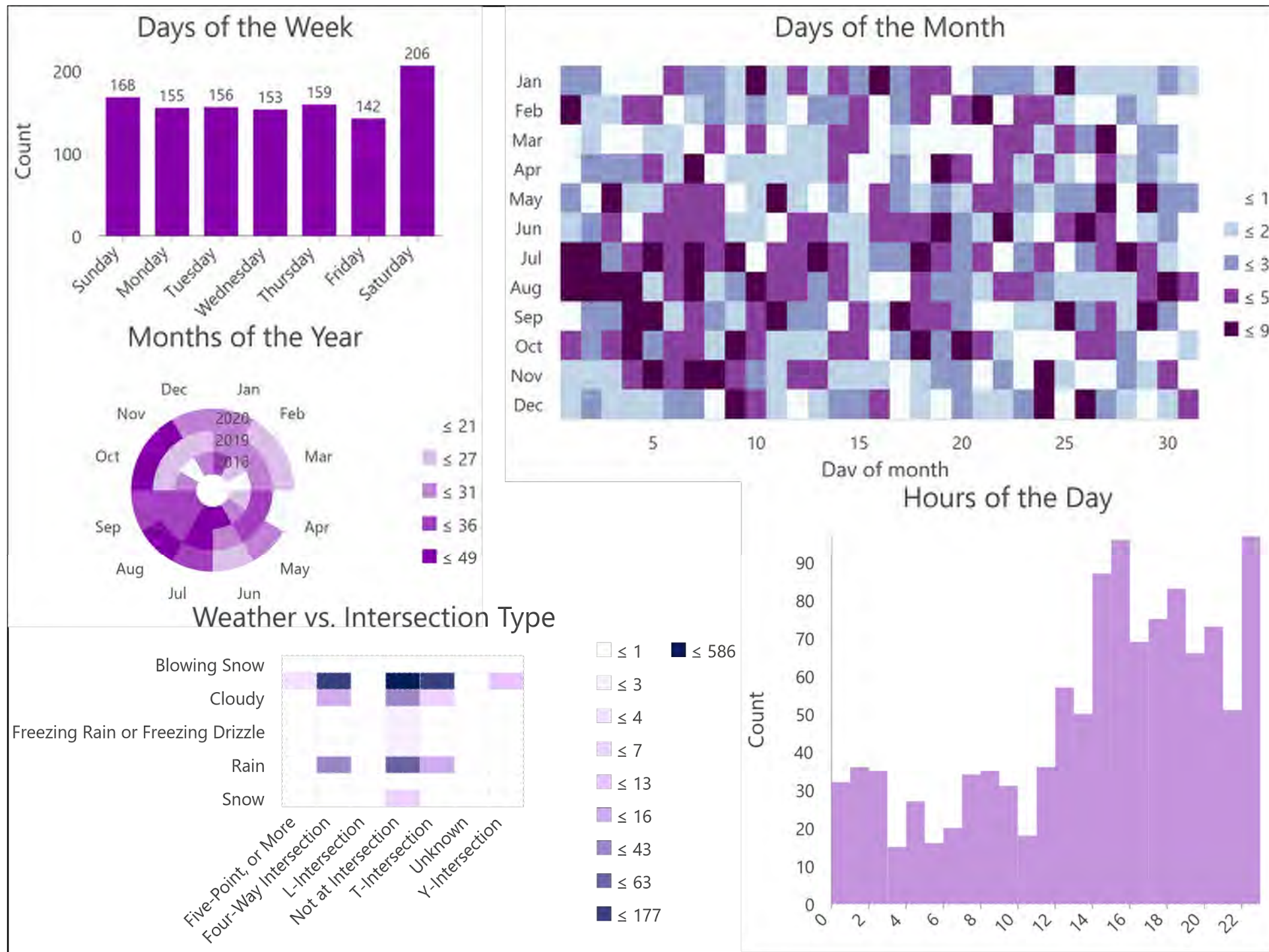
Appendix D

COG Crash Analysis

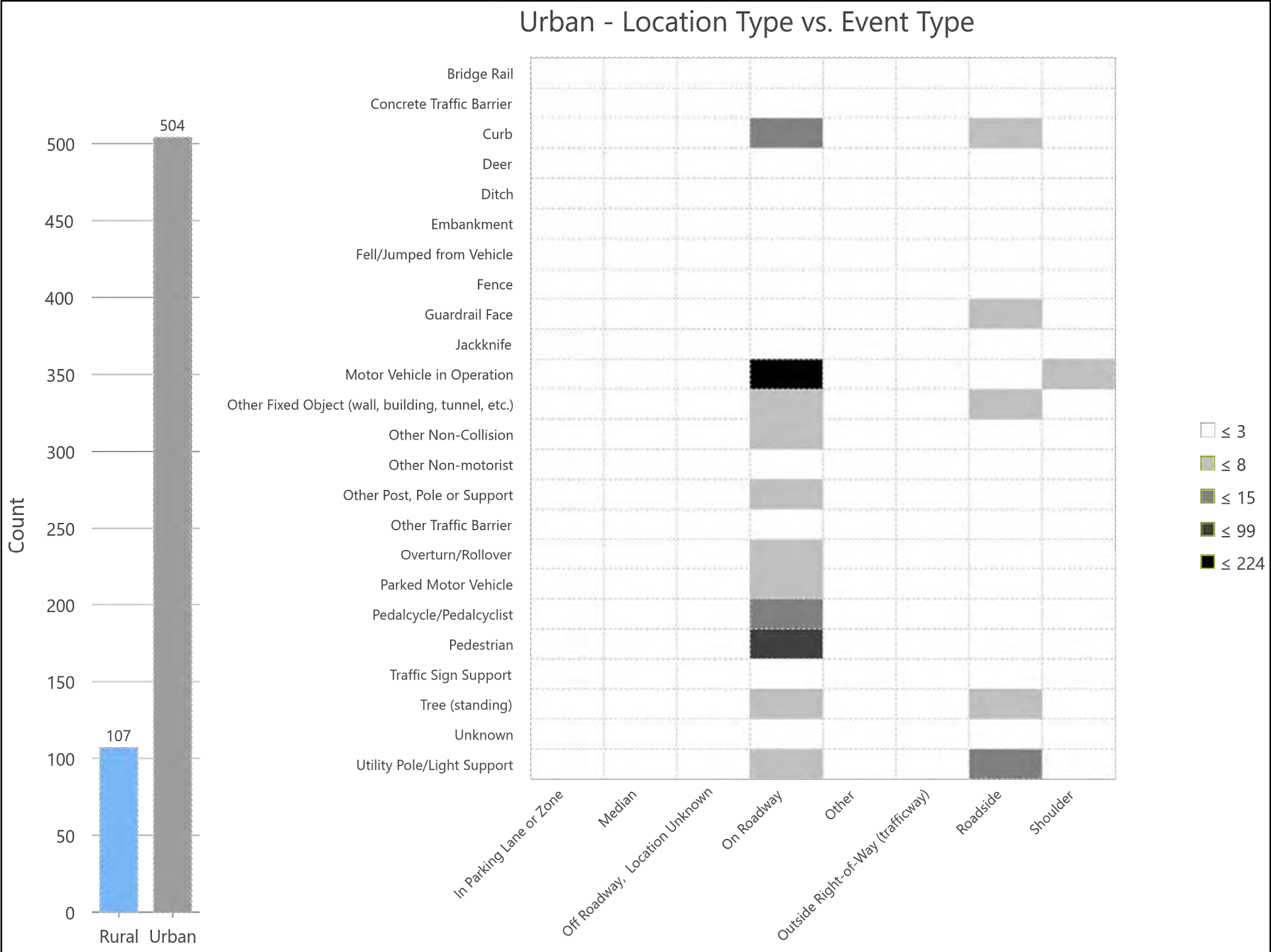
The state of Connecticut is comprised of nine planning regions known as Councils of Government (COGs). Throughout the project planning phase of the HSIP IP compilation, each COG was met with to review projects and impacts within their regions. The data on the following pages was provided to them in an effort to establish data driven projects that make up the Project List in Appendix A.



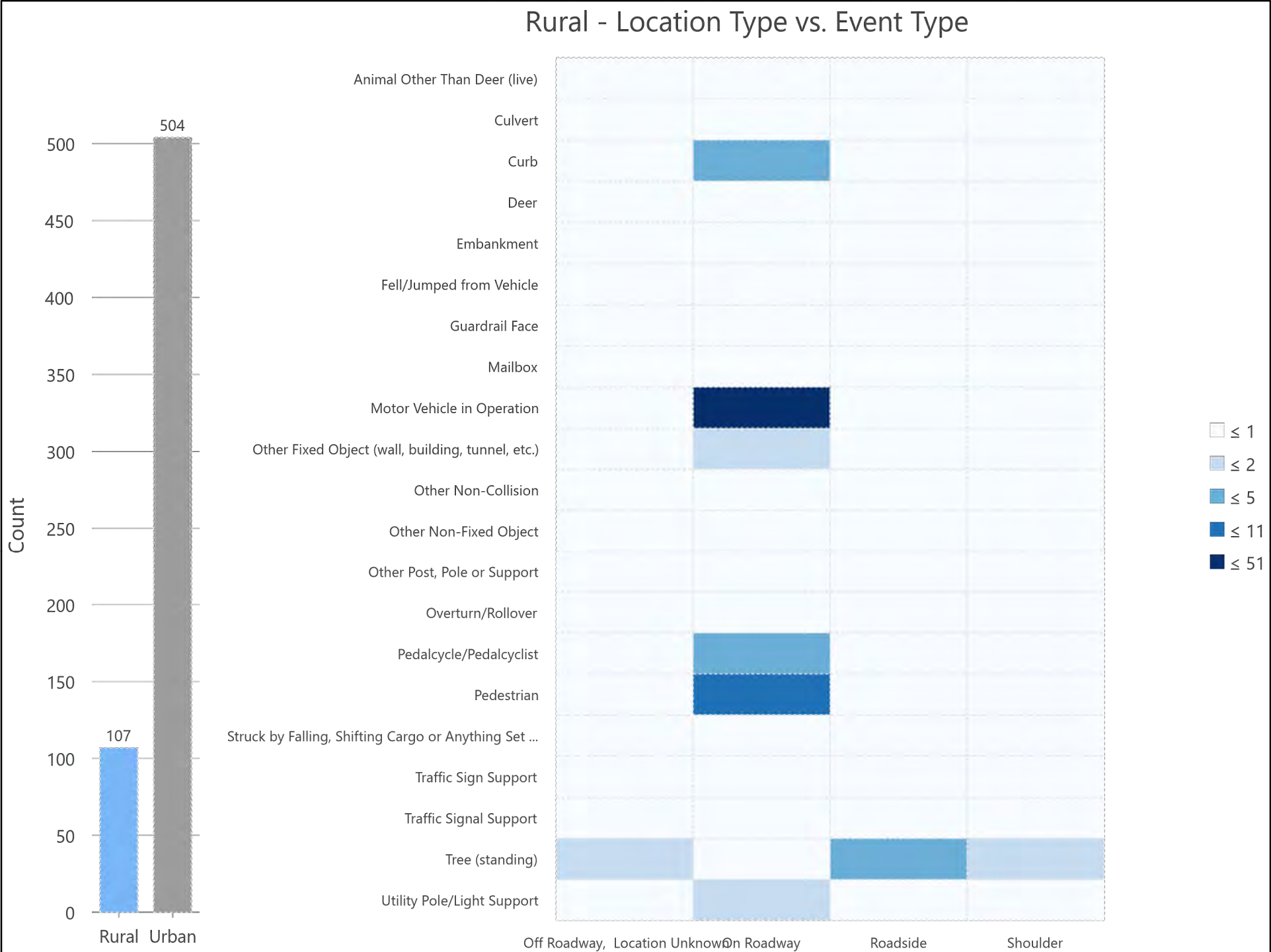
Capitol Time & Conditions K&A Crash Data 2018-2020



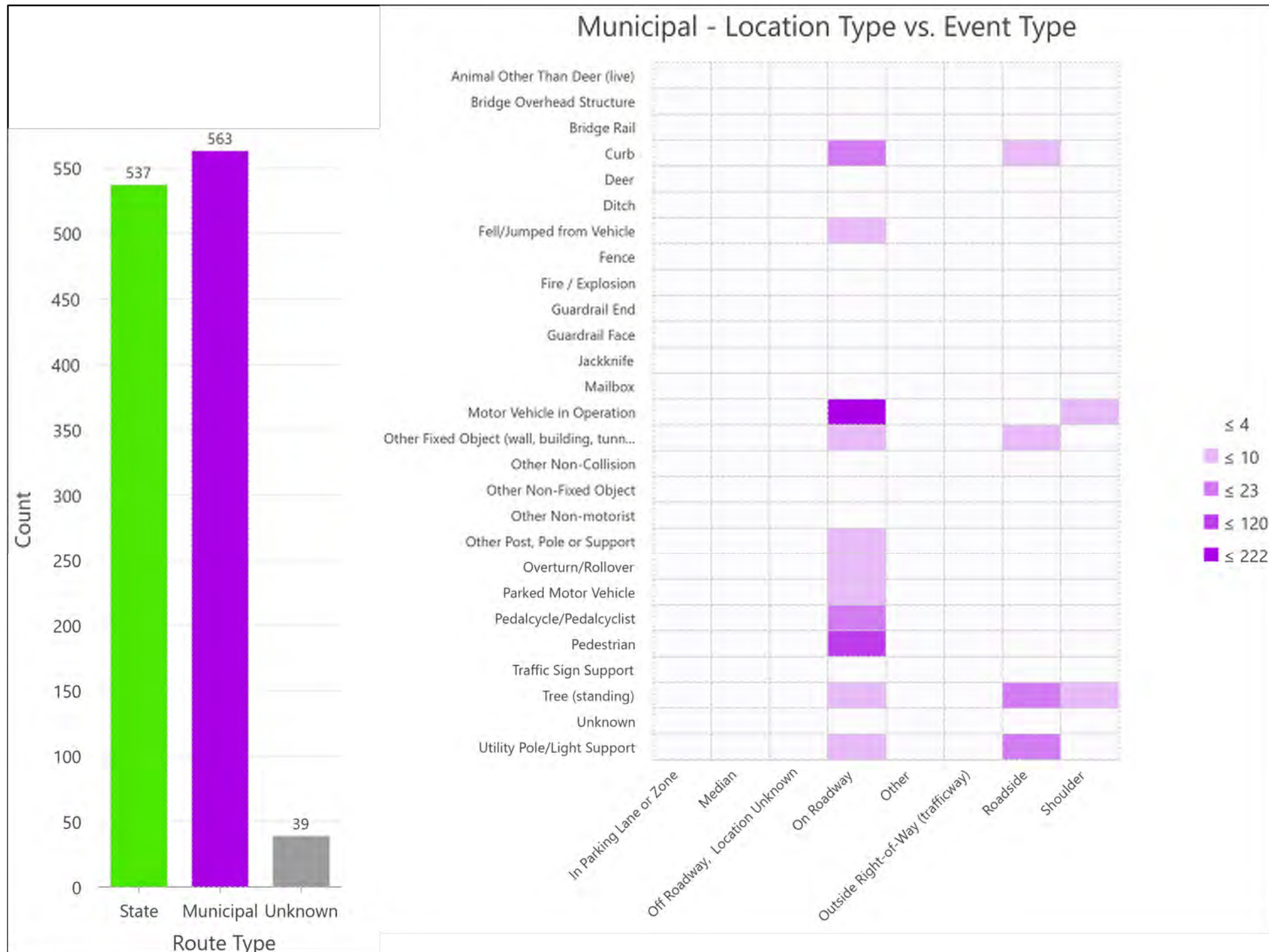
Capitol Rural vs. Urban K&A Crash Data 2018-2020



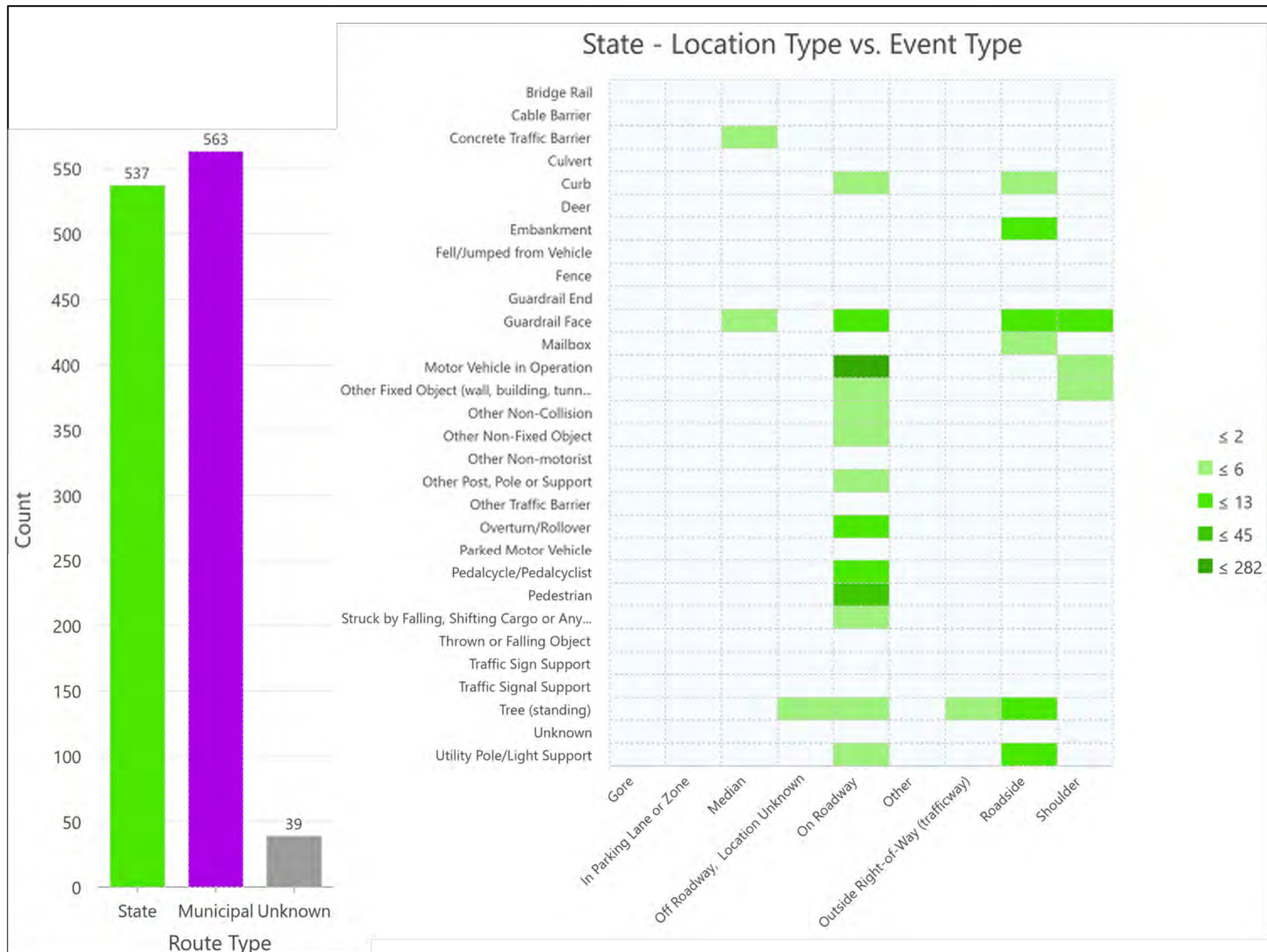
Capitol Rural vs. Urban K&A Crash Data 2018-2020

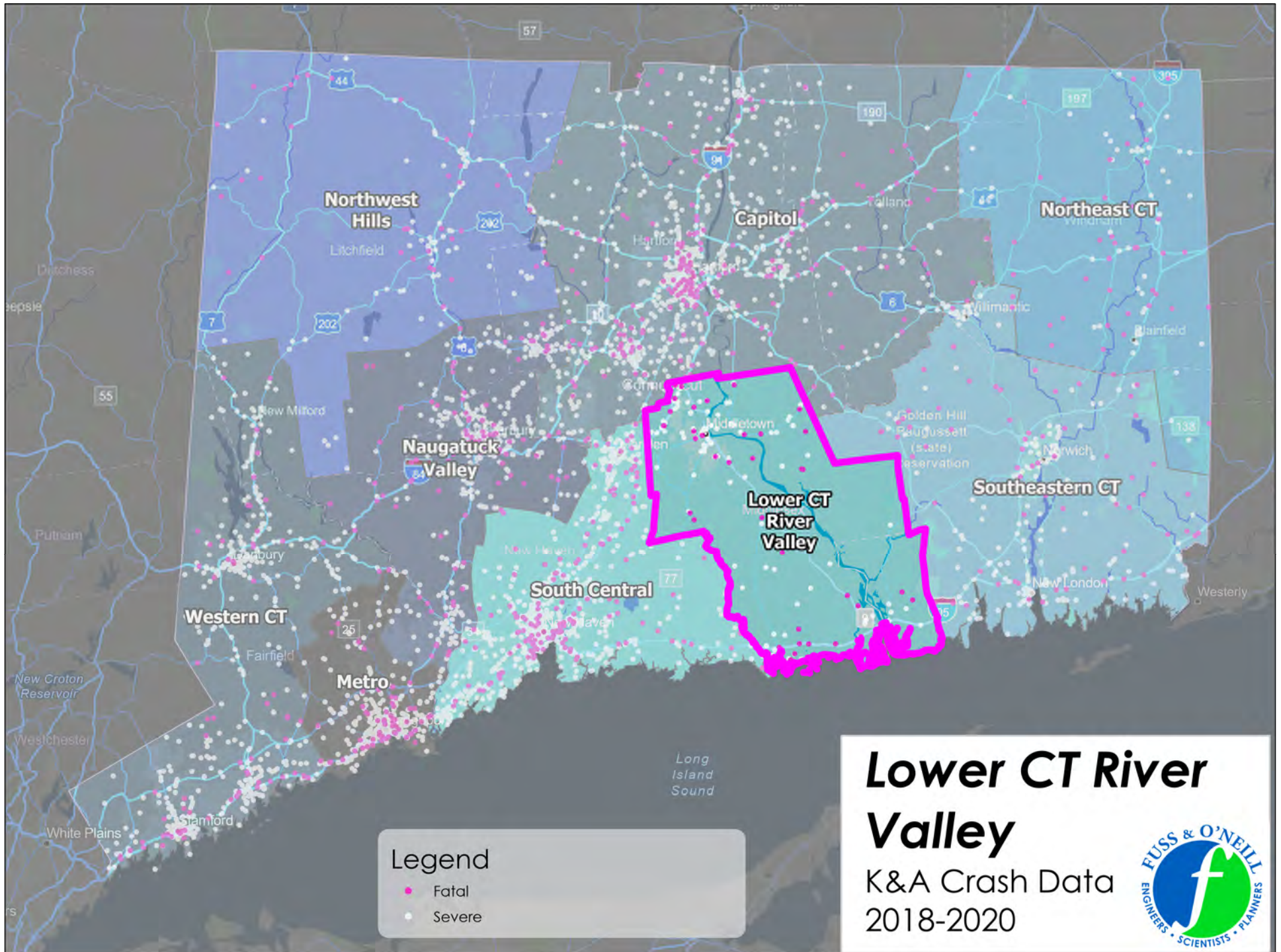


Capitol State vs. Municipal Road K&A Crash Data 2018-2020

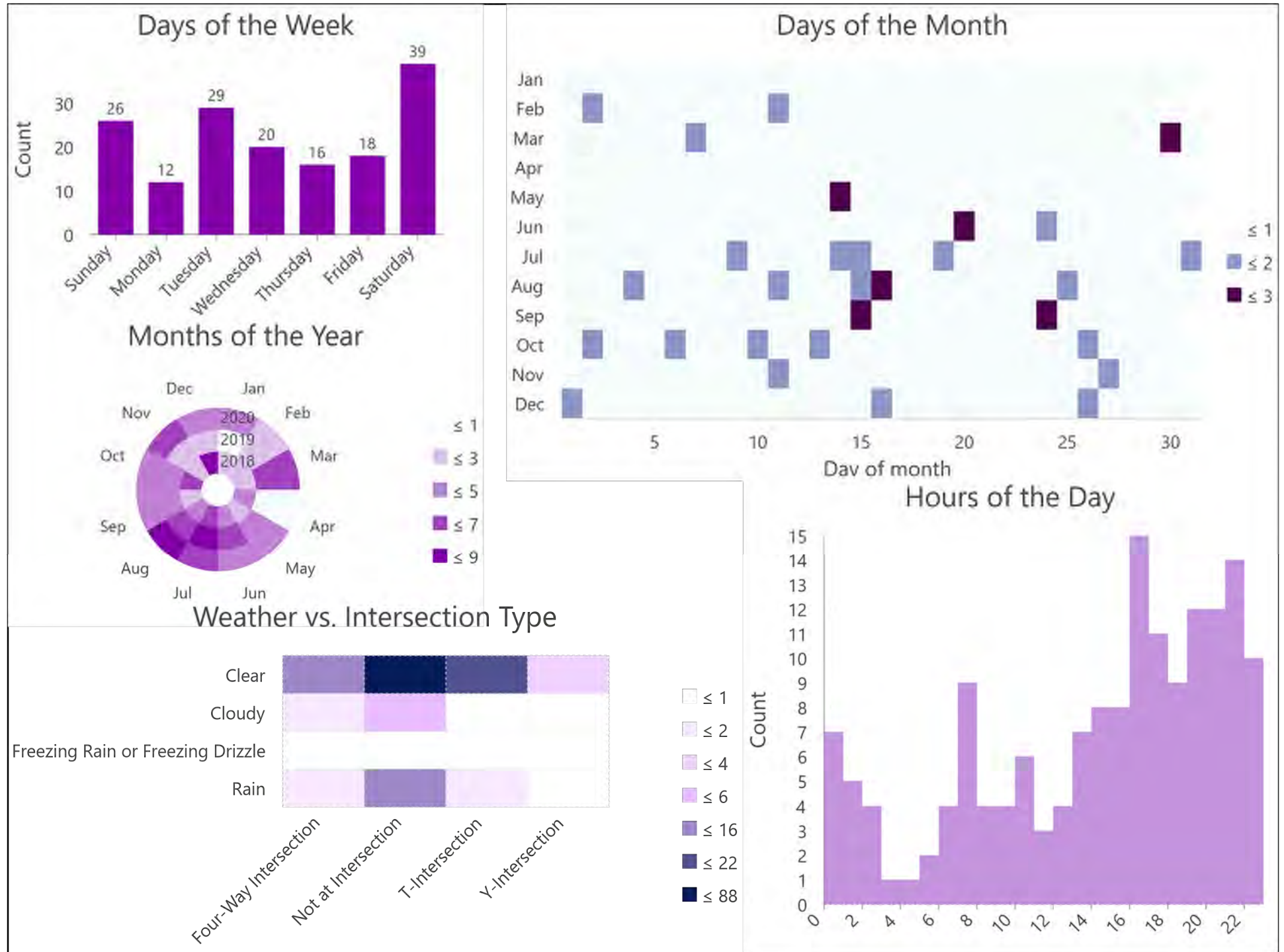


Capitol State vs. Municipal Road K&A Crash Data 2018-2020

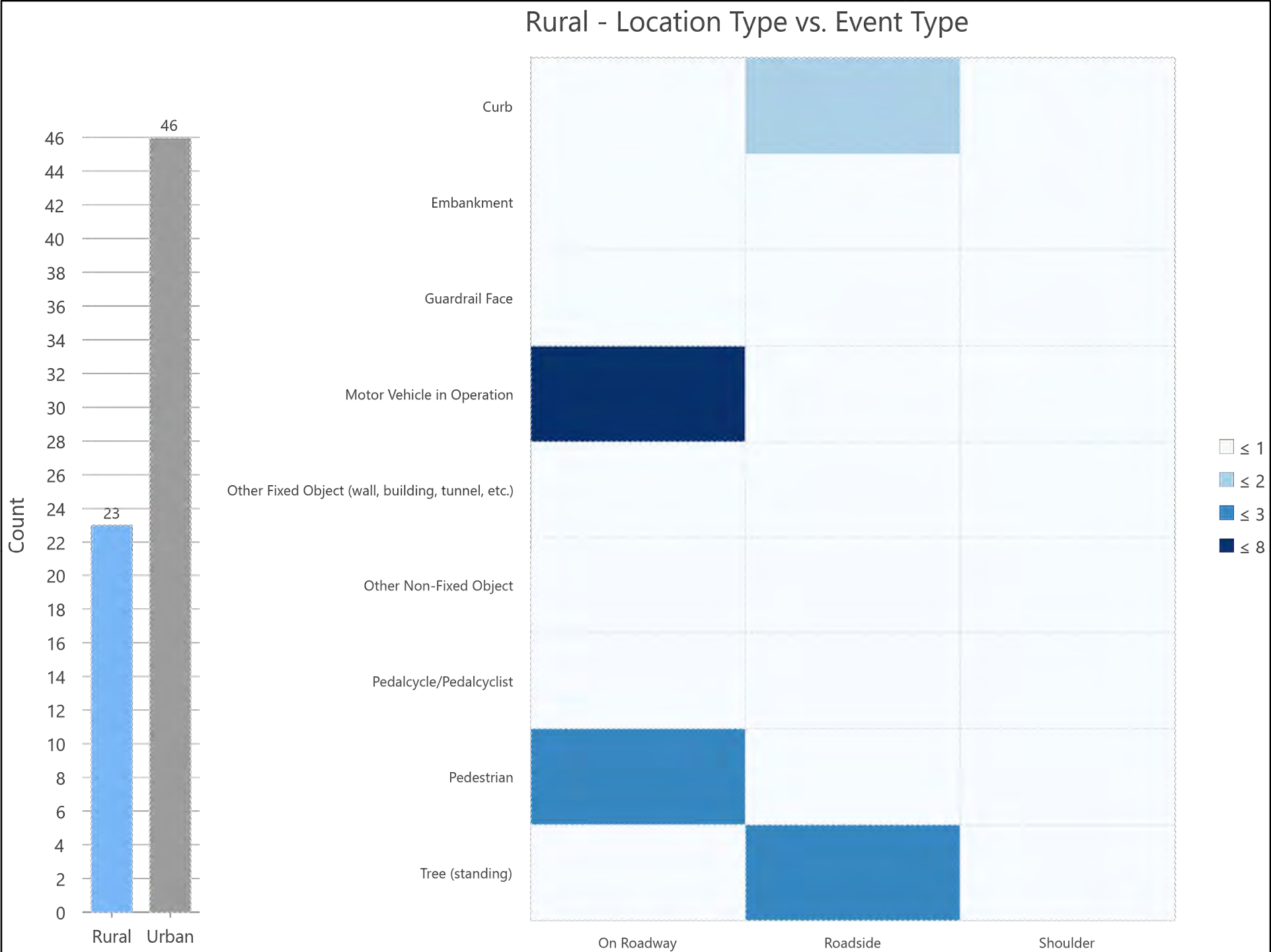




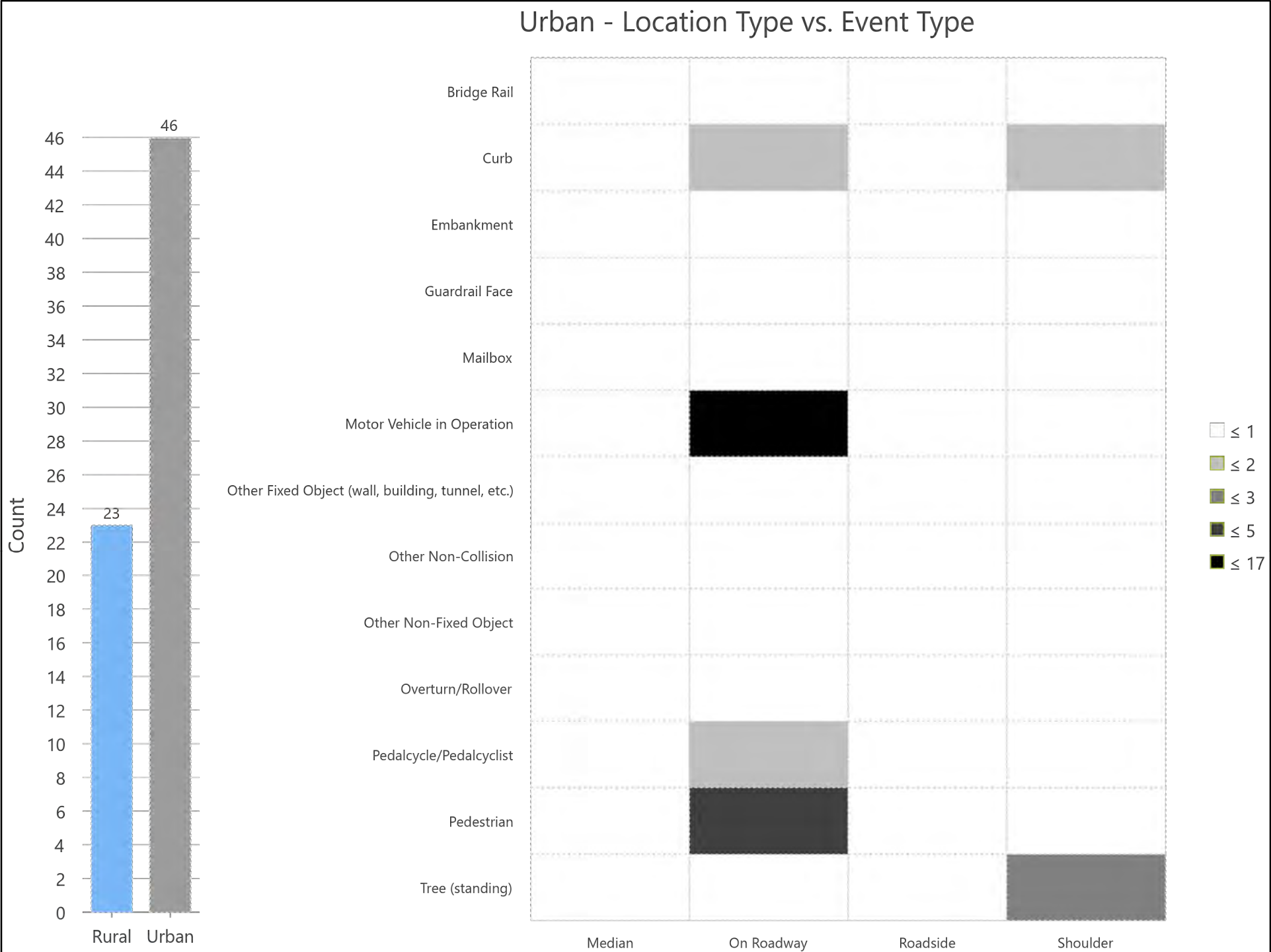
Lower CT River Valley Time & Conditions K&A Crash Data 2018-2020



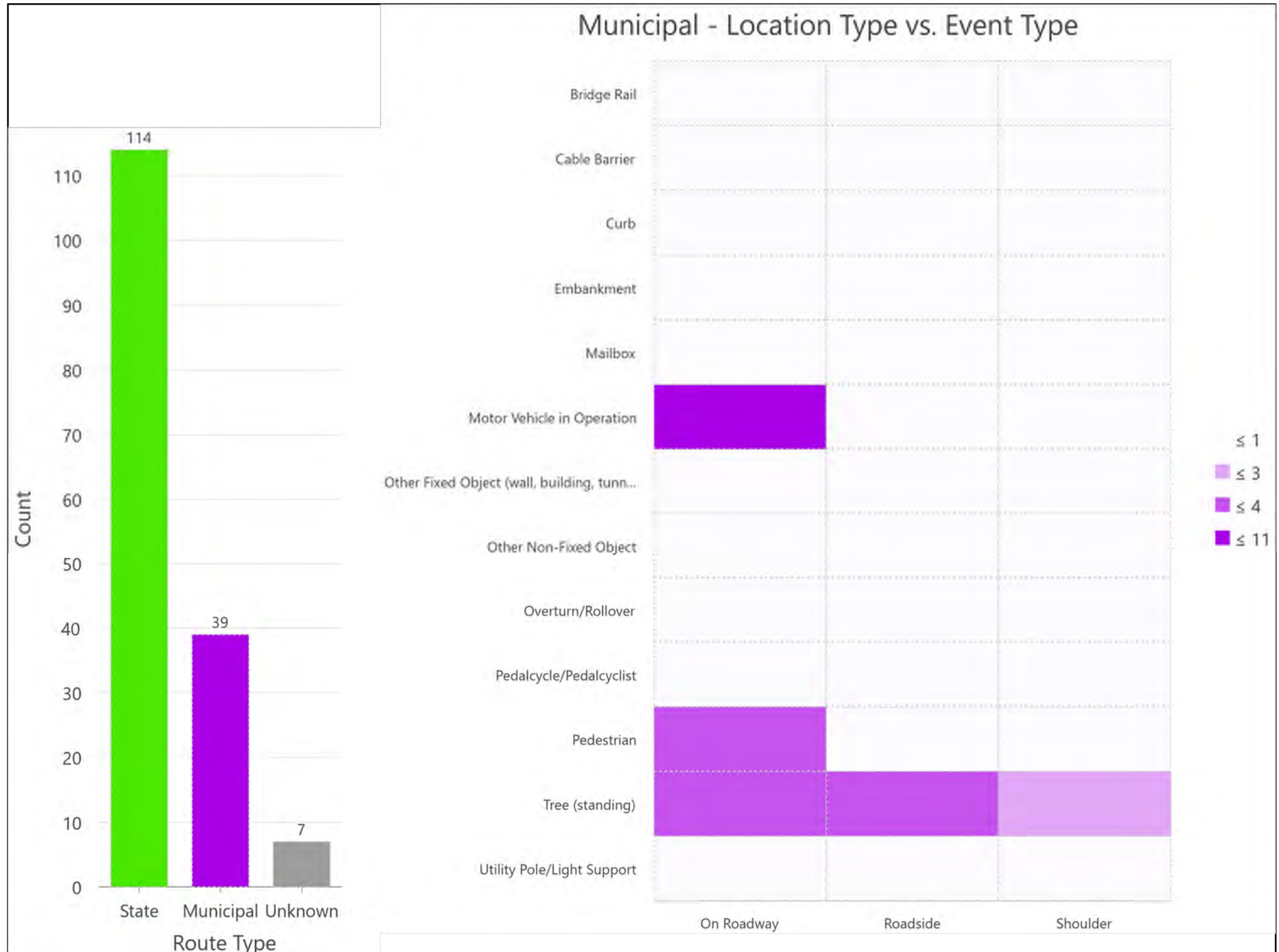
Lower CT River Valley Rural vs. Urban K&A Crash Data 2018-2020



Lower CT River Valley Rural vs. Urban K&A Crash Data 2018-2020

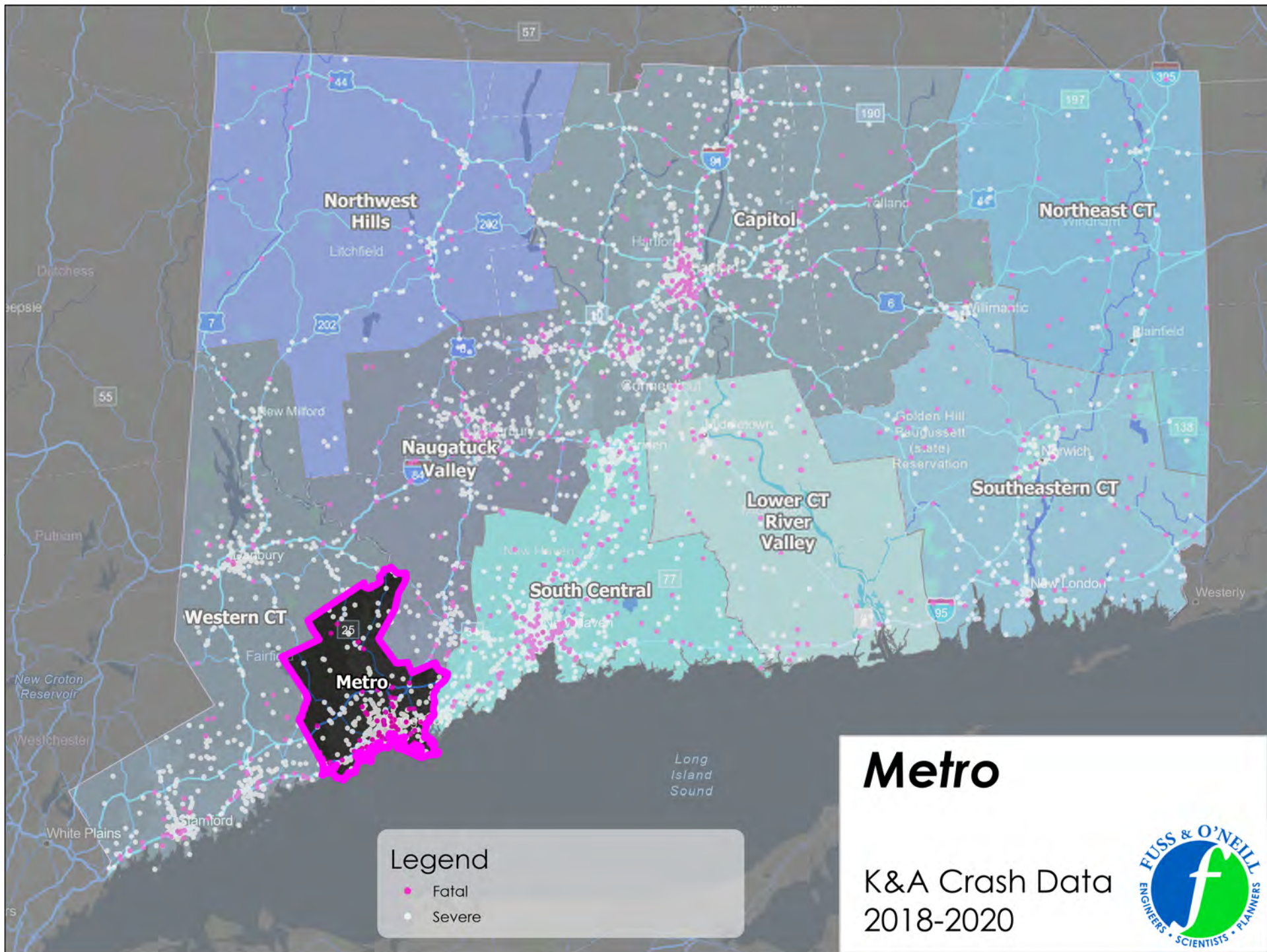


Lower CT River Valley State vs. Municipal Road K&A Crash Data 2018-2020

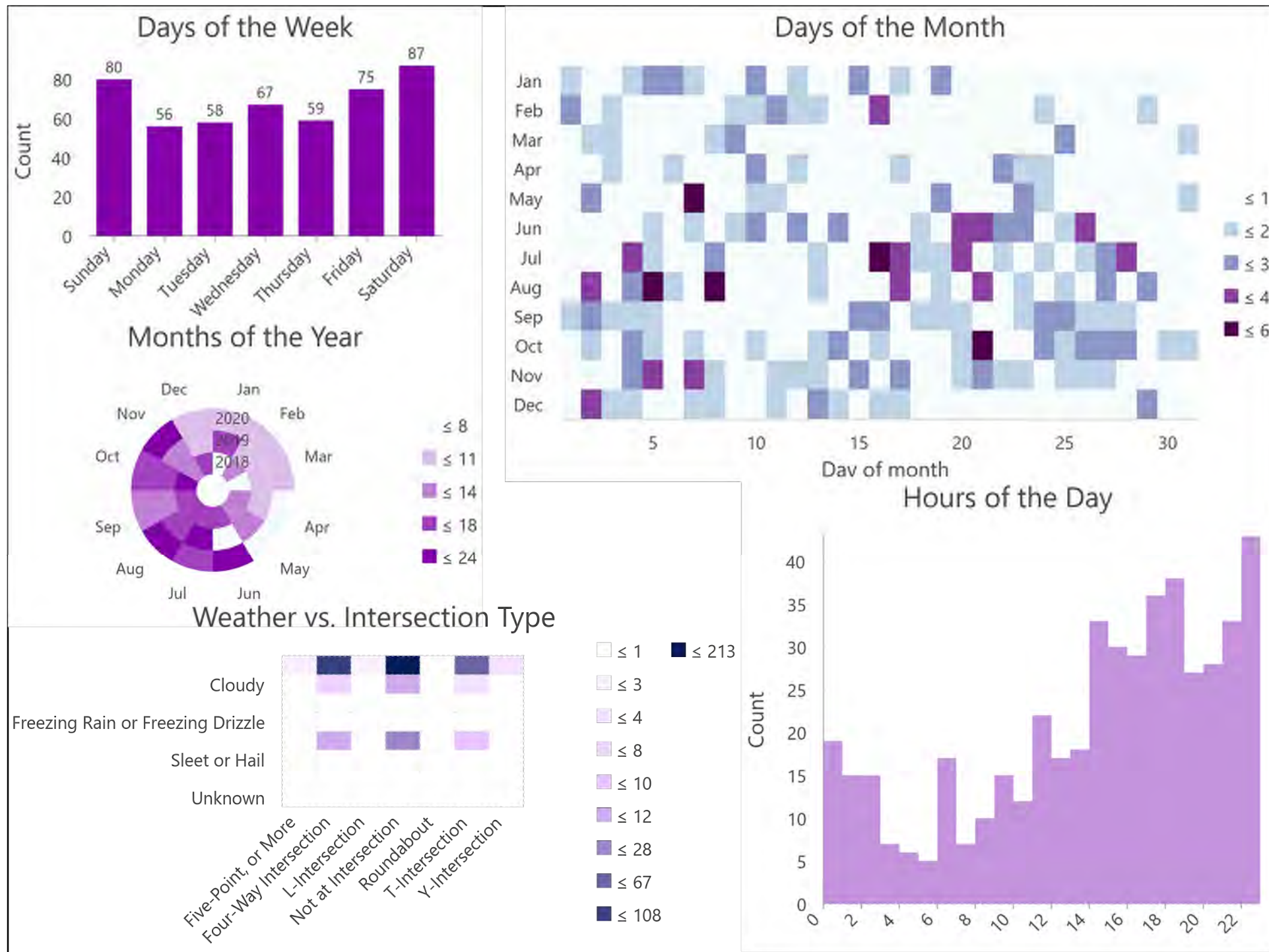


Lower CT River Valley State vs. Municipal Road K&A Crash Data 2018-2020





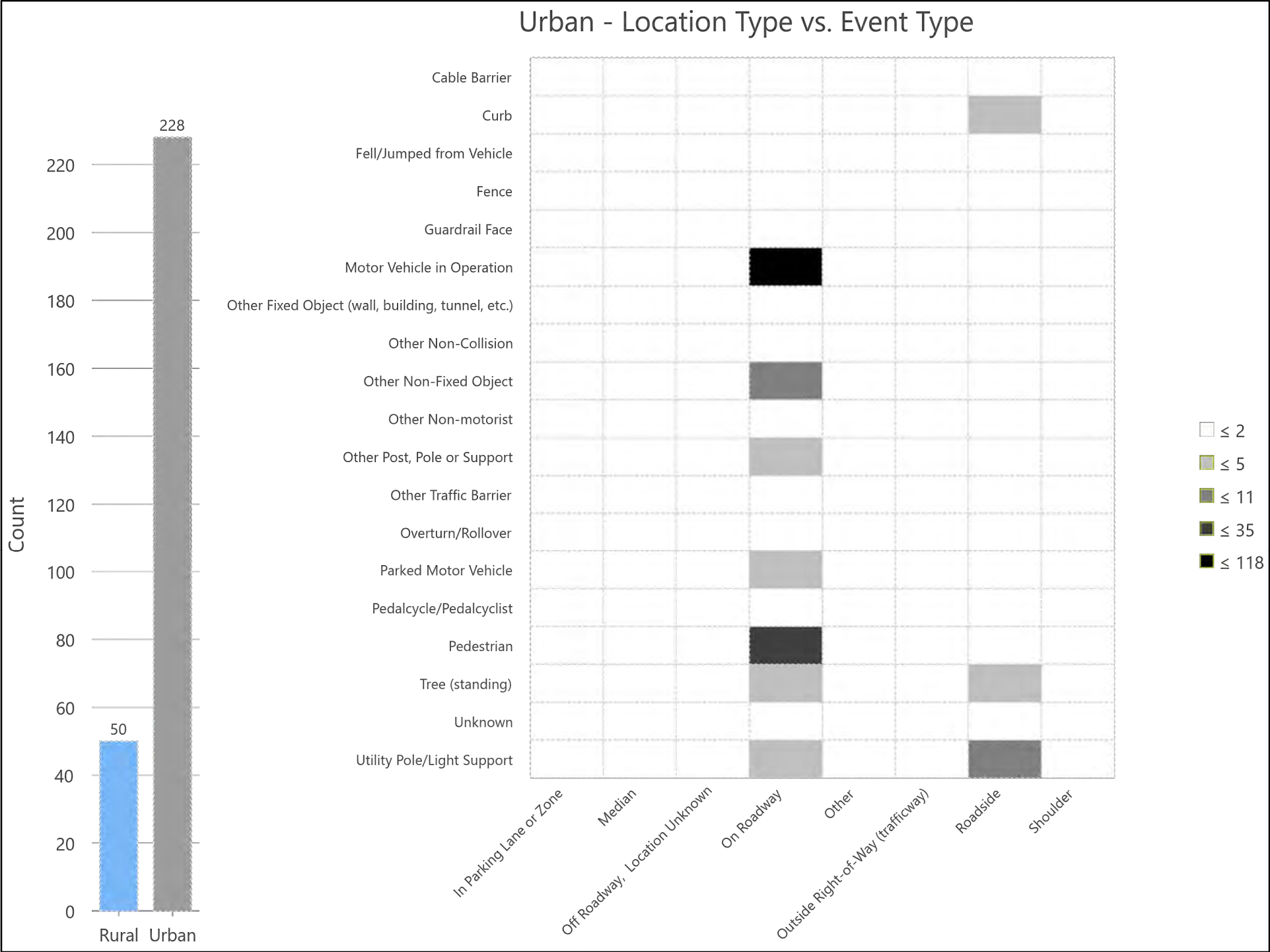
Metro Time & Conditions K&A Crash Data 2018-2020



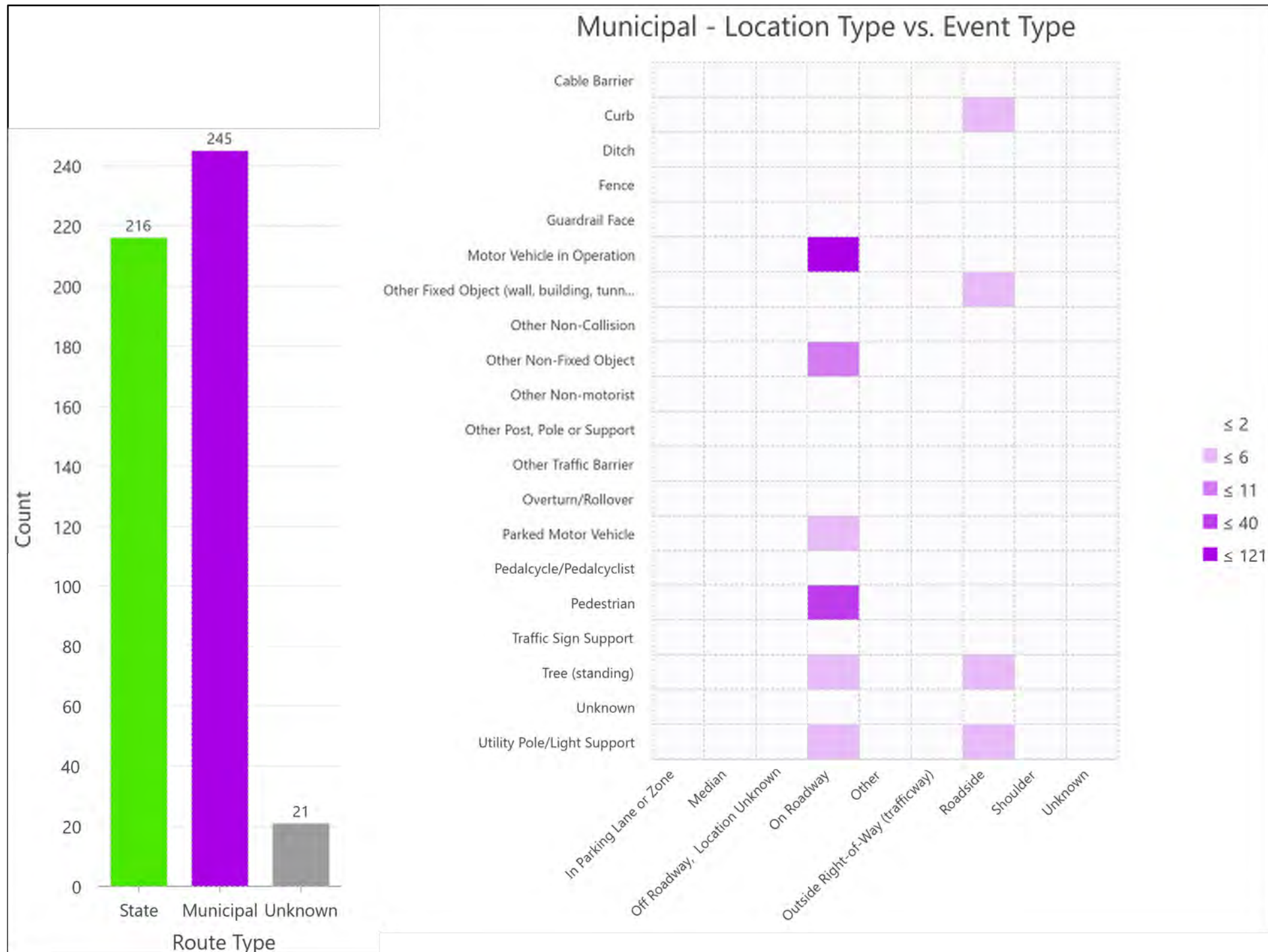
Metro Rural vs. Urban K&A Crash Data 2018-2020



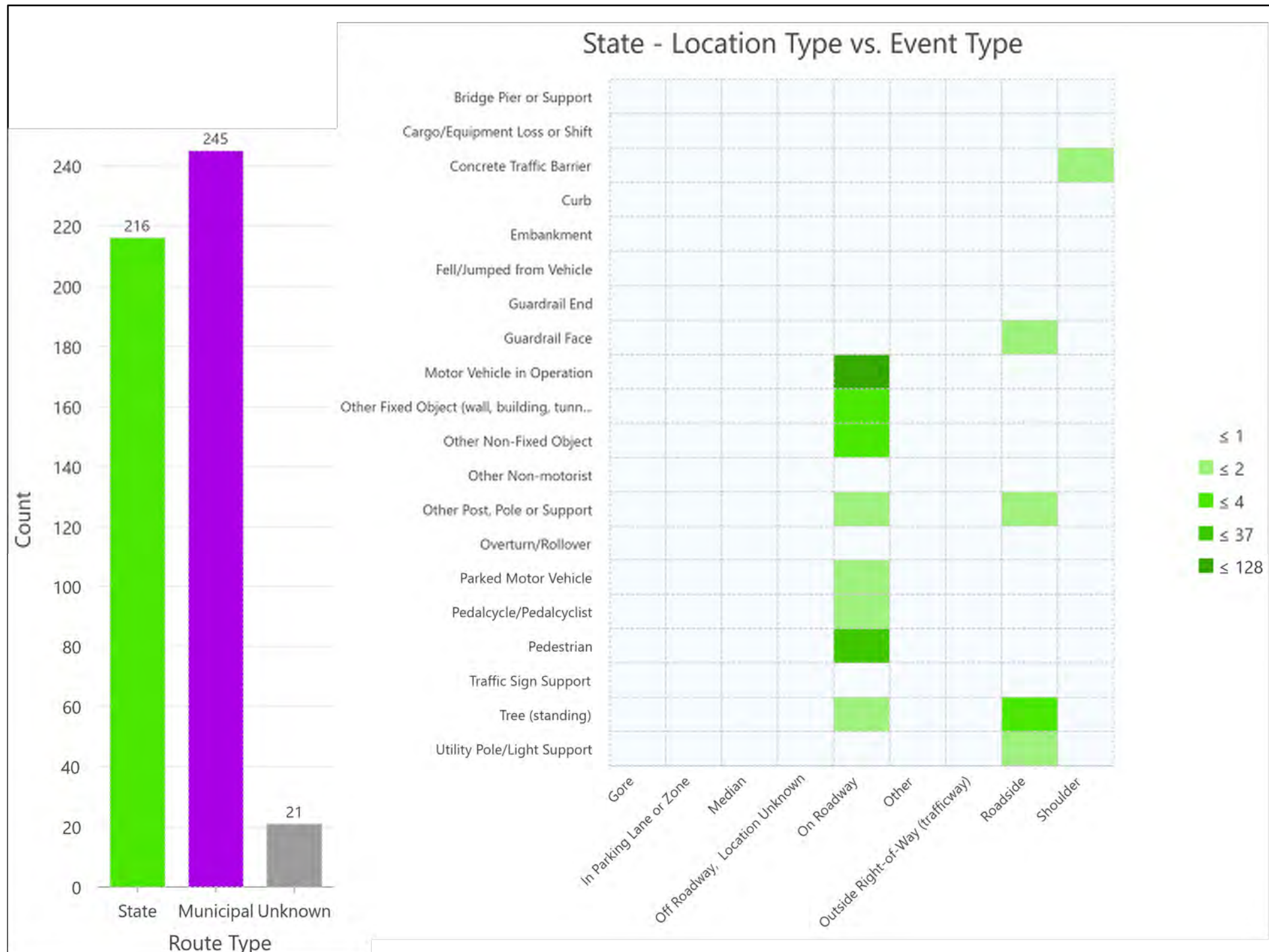
Metro Rural vs. Urban K&A Crash Data 2018-2020

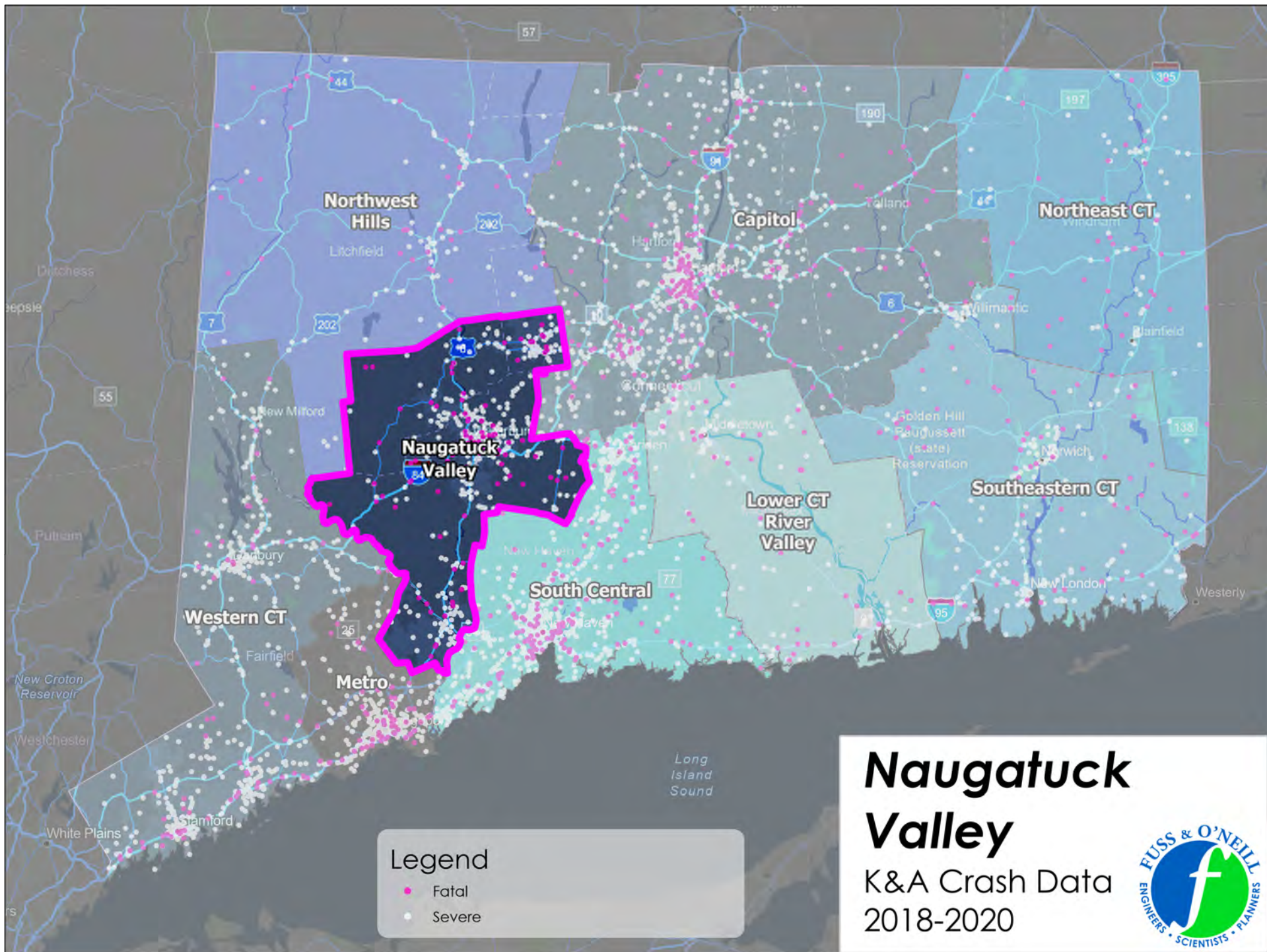


Metro State vs. Municipal Road K&A Crash Data 2018-2020

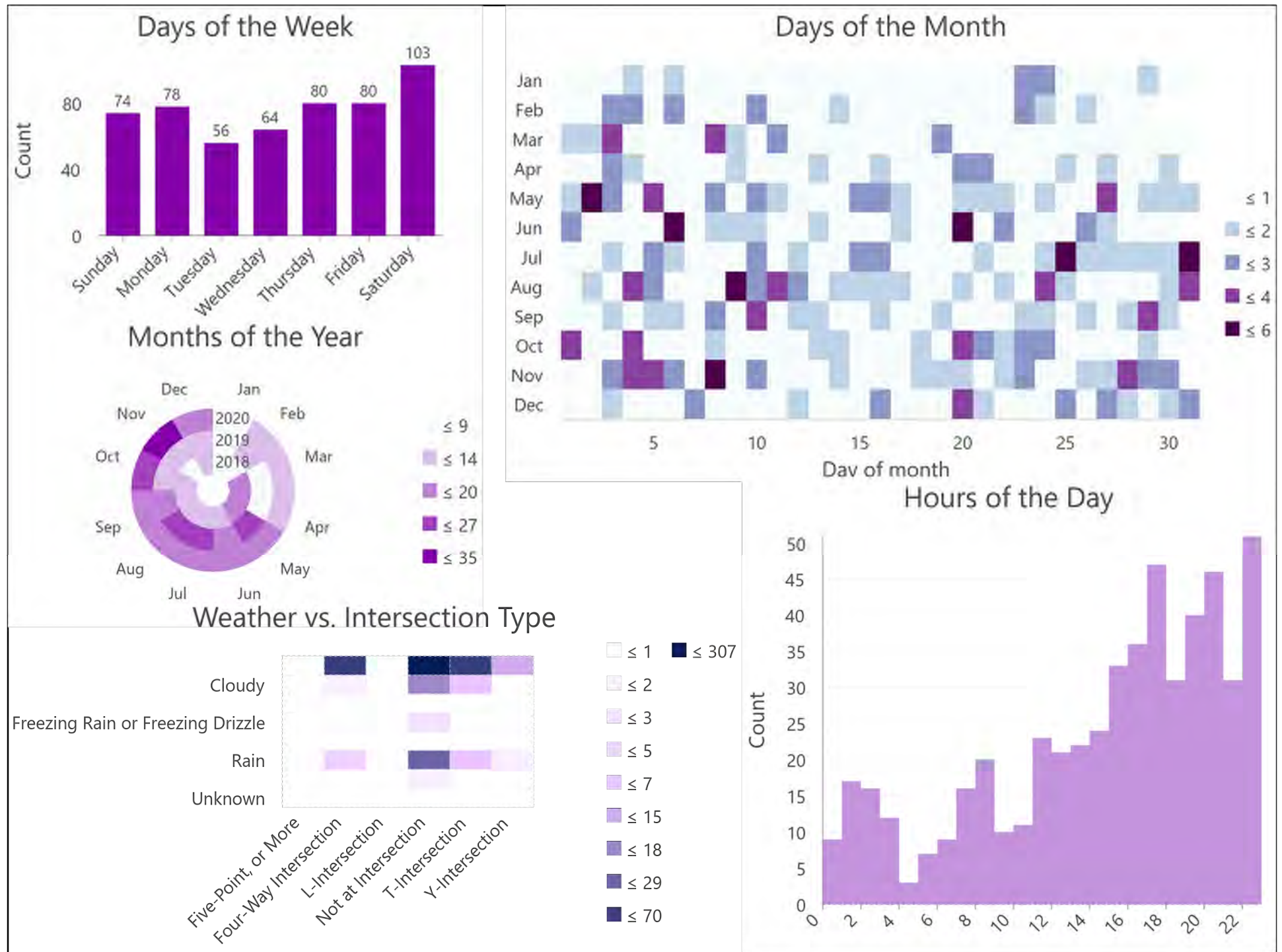


Metro State vs. Municipal Road K&A Crash Data 2018-2020

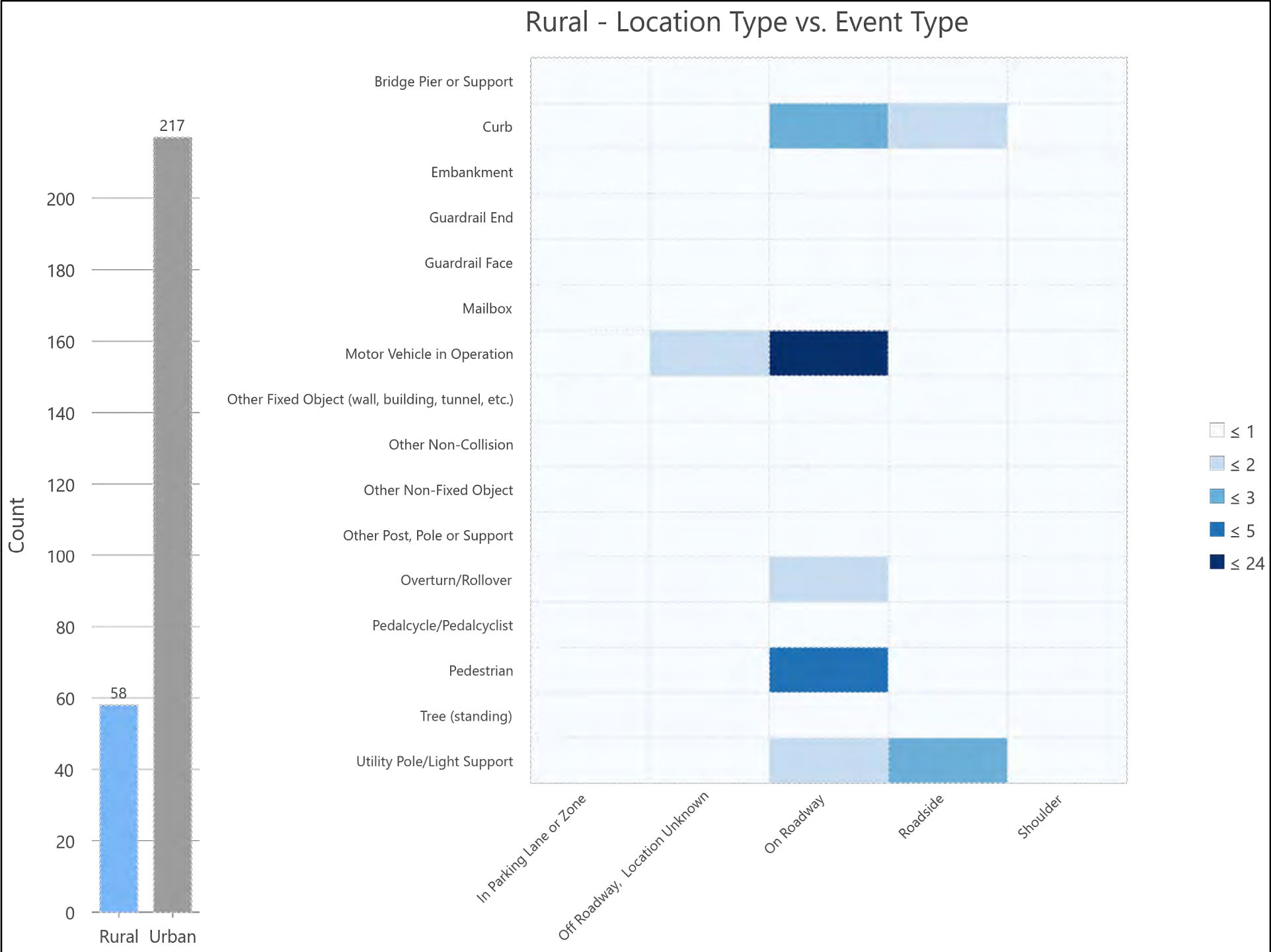




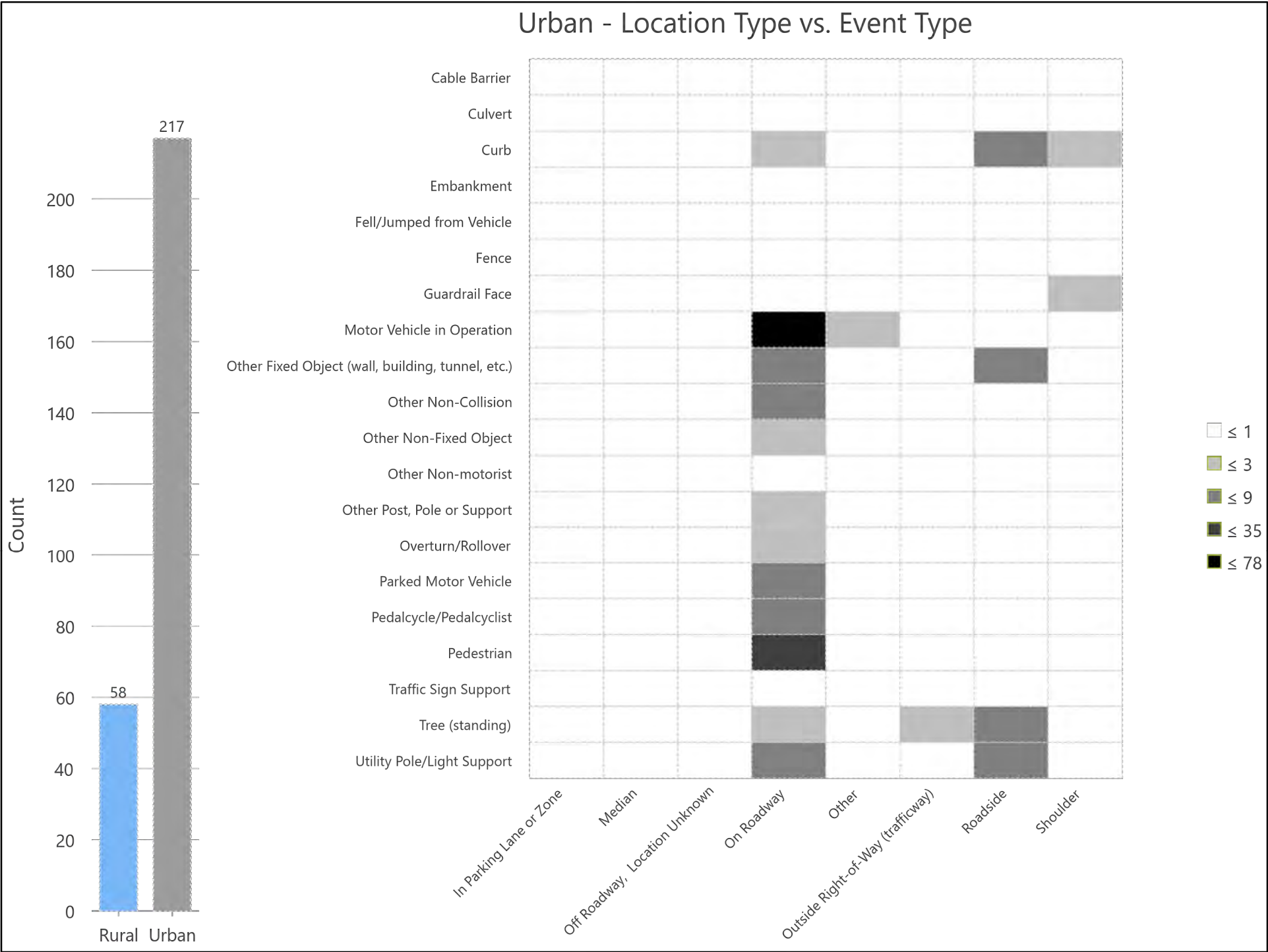
Naugatuck Valley Time & Conditions K&A Crash Data 2018-2020



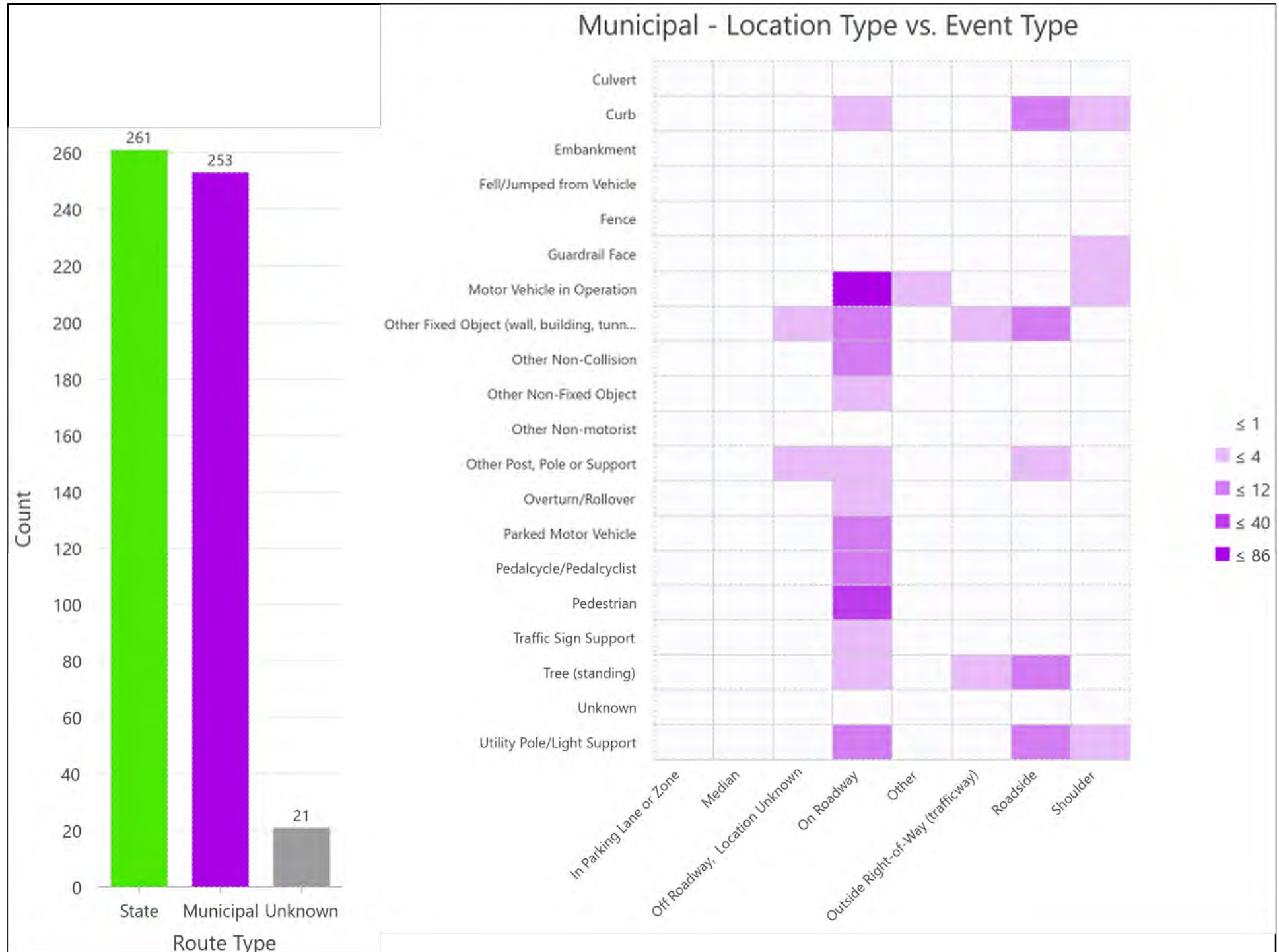
Naugatuck Valley Rural vs. Urban K&A Crash Data 2018-2020



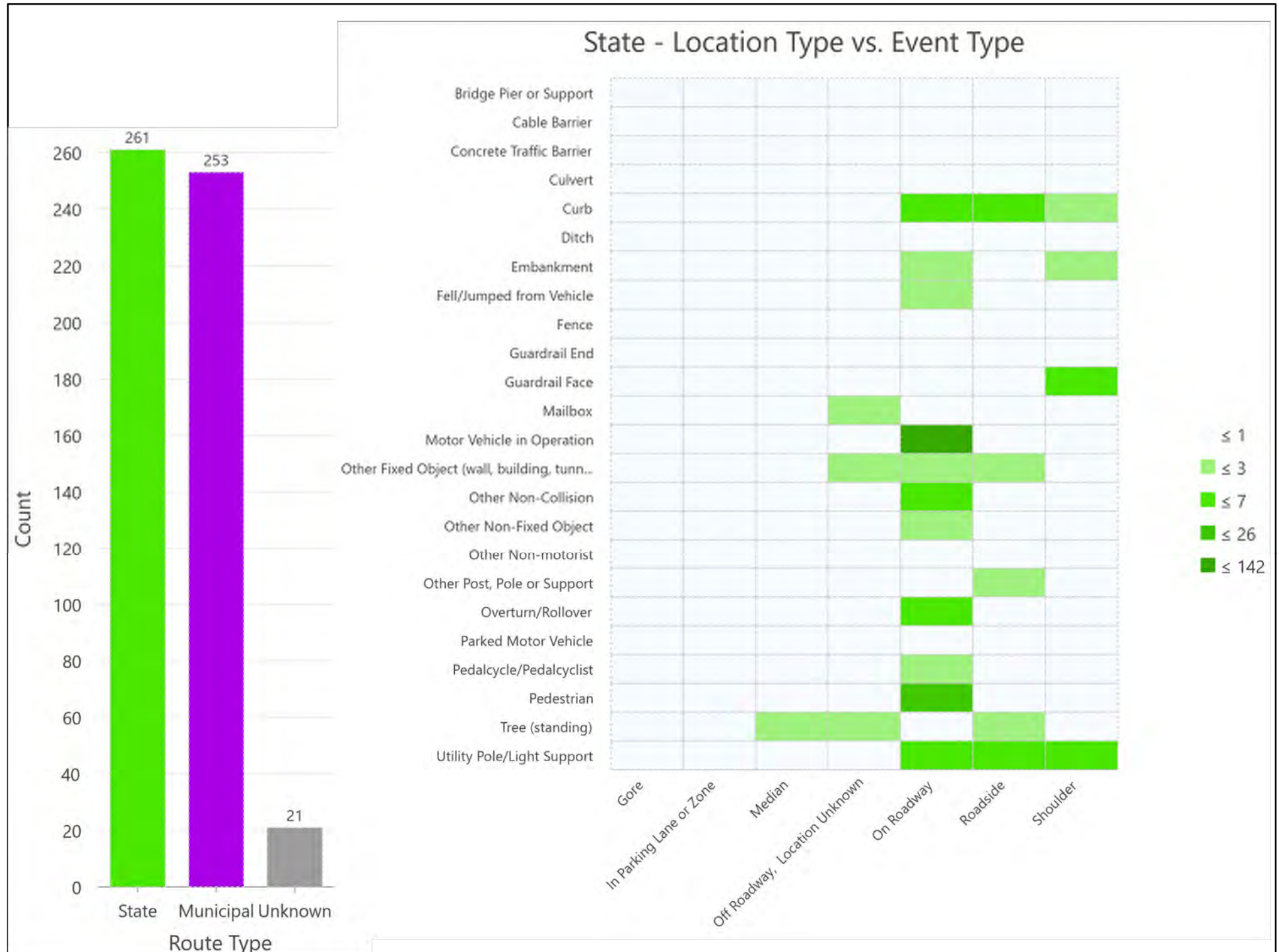
Naugatuck Valley Rural vs. Urban K&A Crash Data 2018-2020

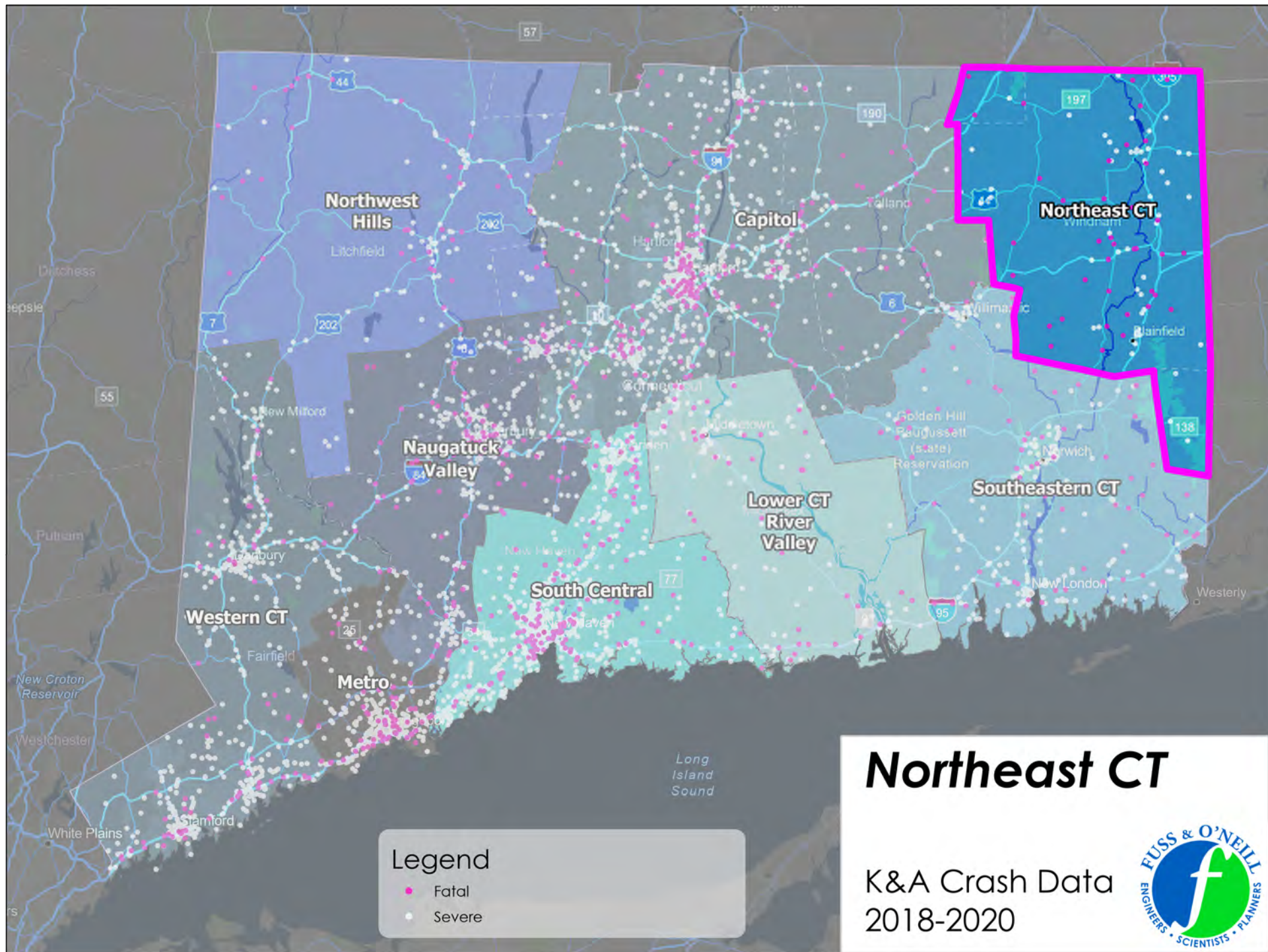


Naugatuck Valley State vs. Municipal Road K&A Crash Data 2018-2020

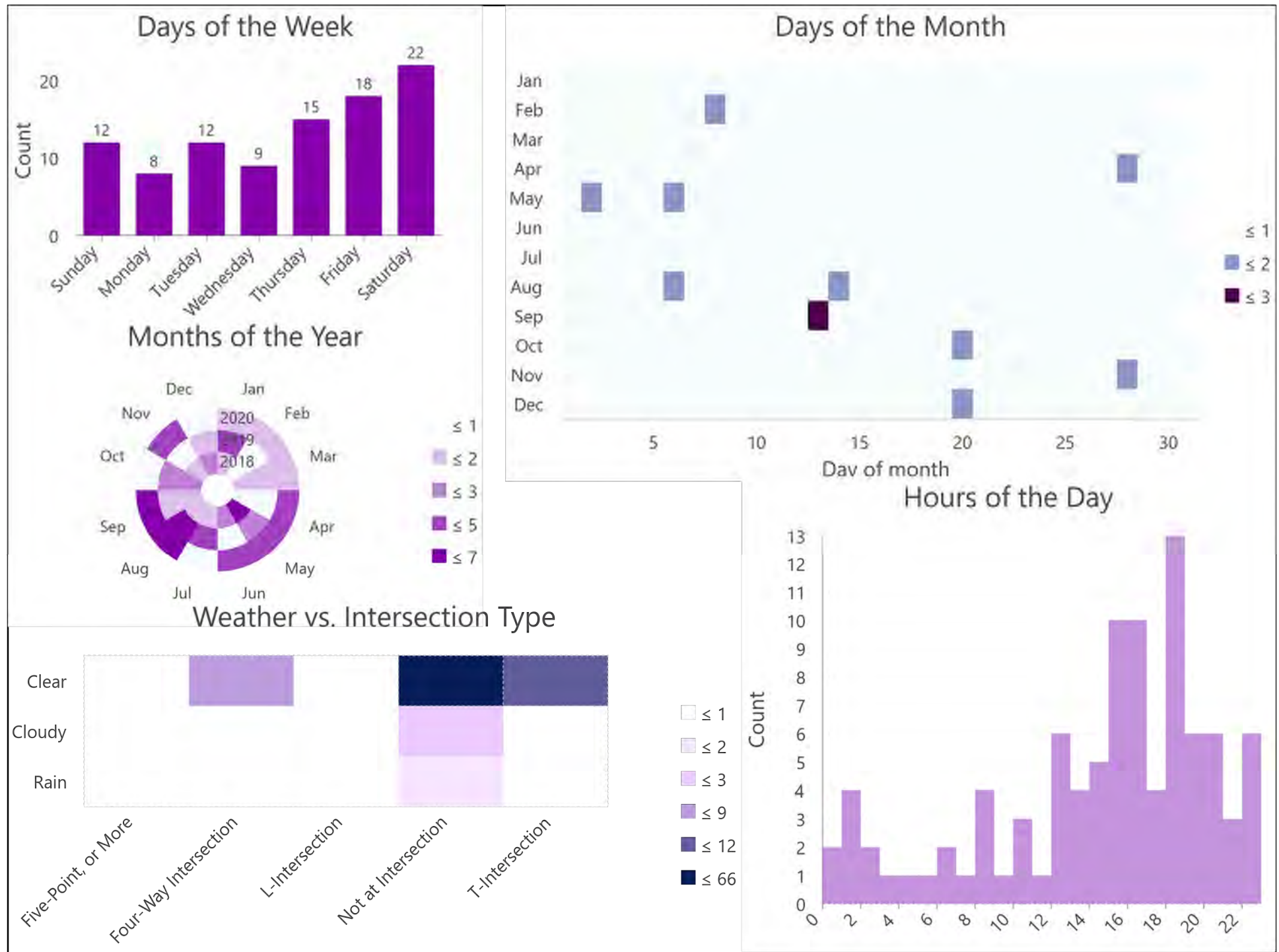


Naugatuck Valley State vs. Municipal Road K&A Crash Data 2018-2020

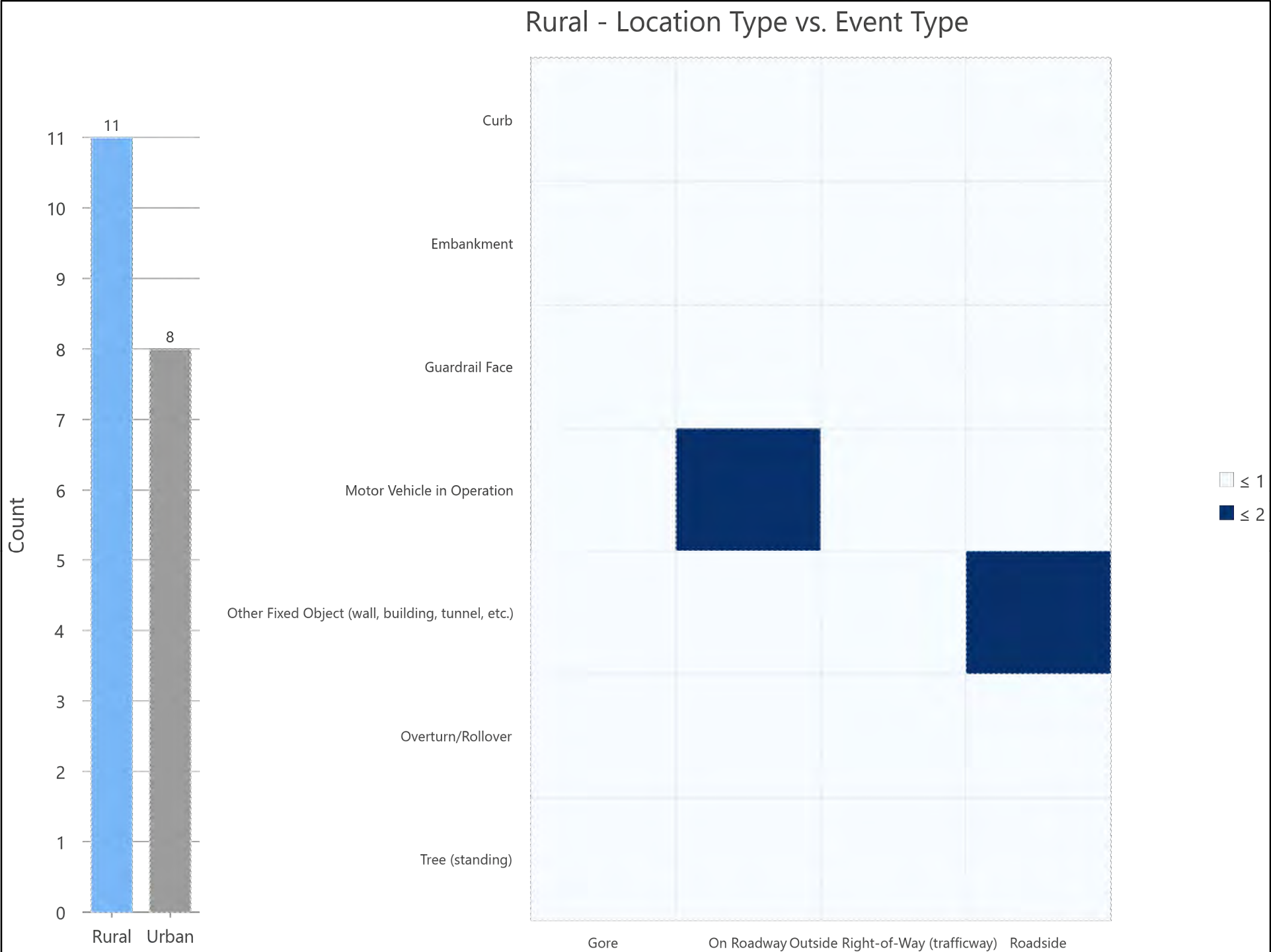




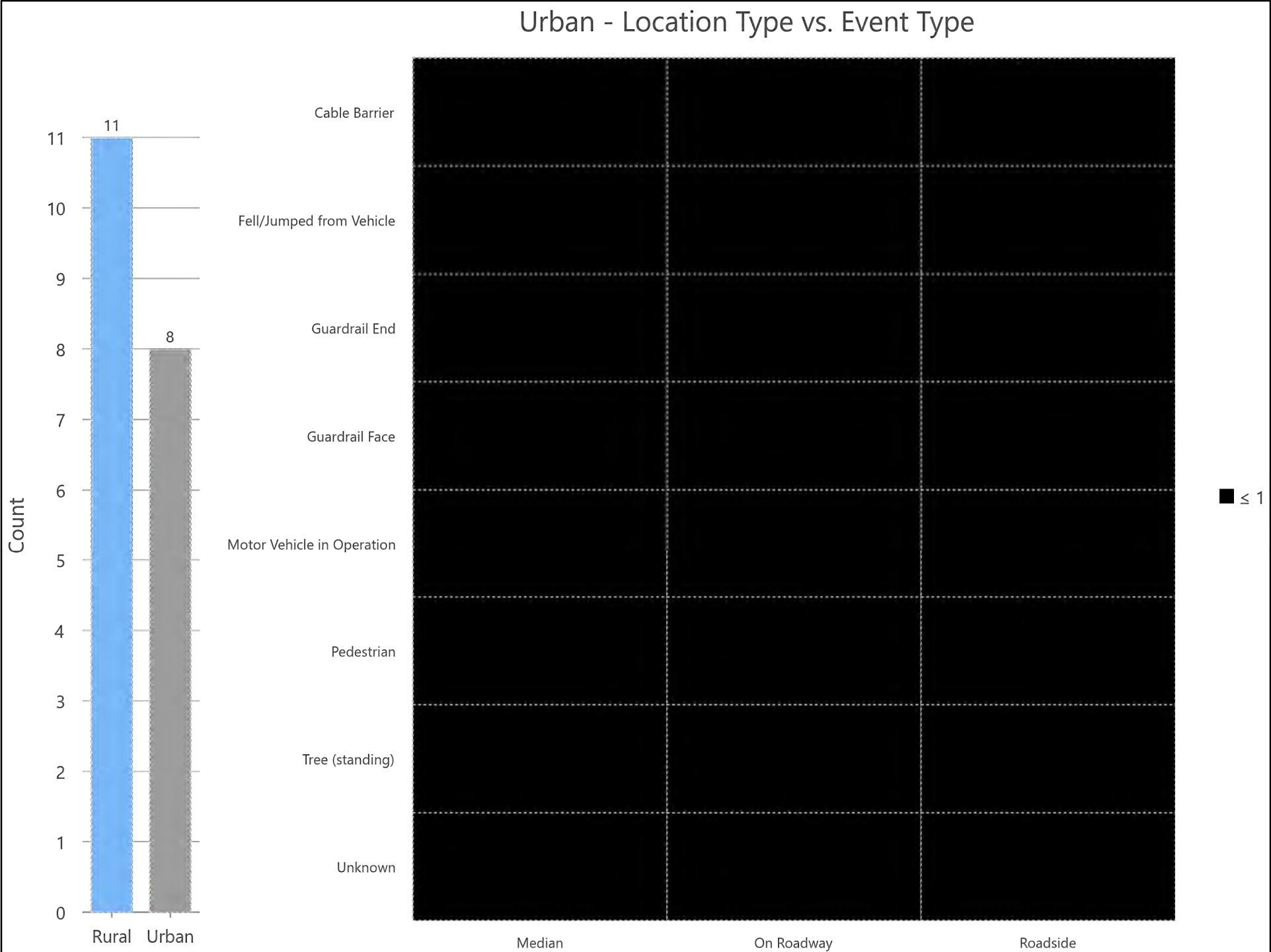
Northeast CT Time & Conditions K&A Crash Data 2018-2020



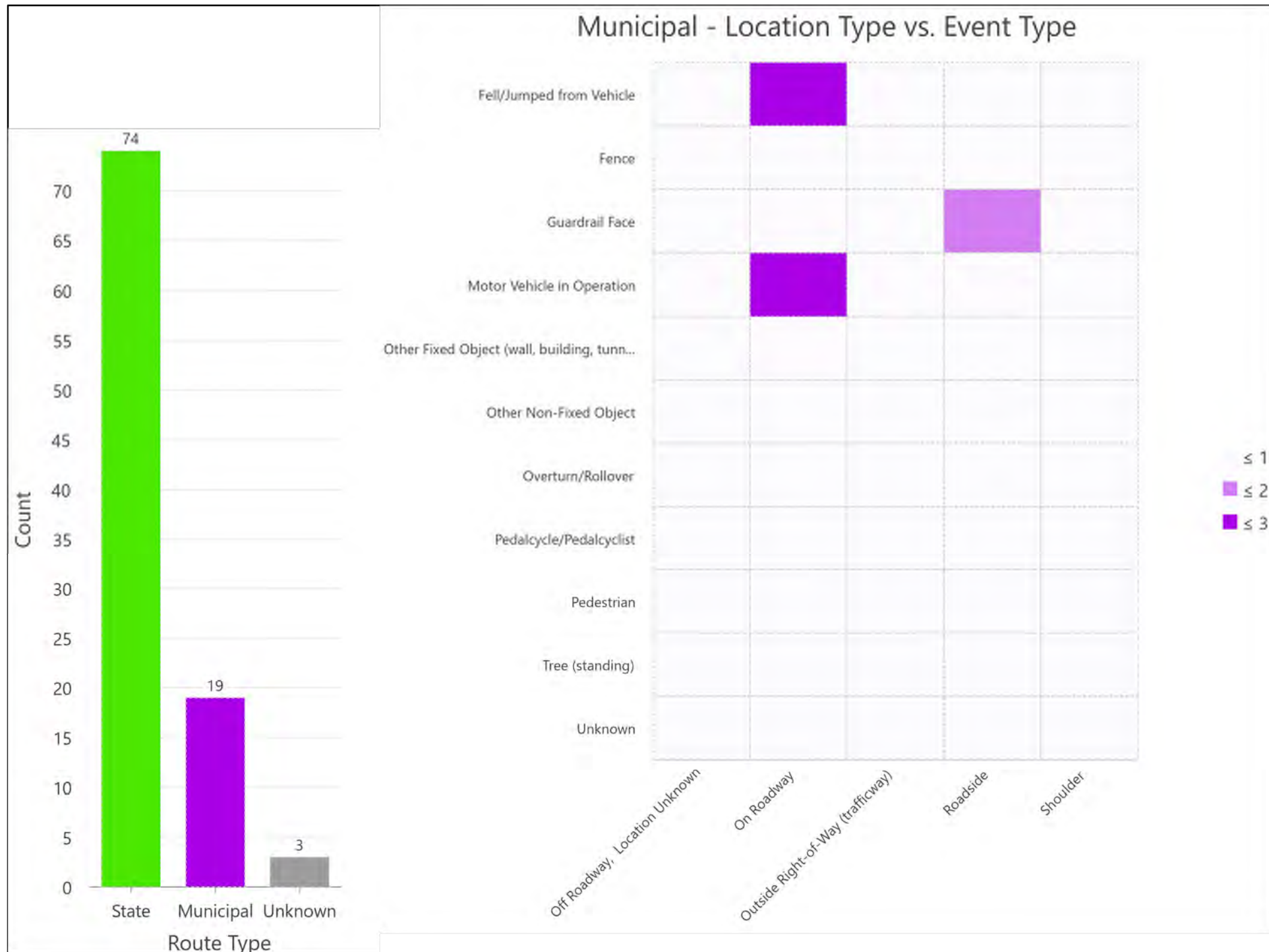
Northeast CT Rural vs. Urban K&A Crash Data 2018-2020



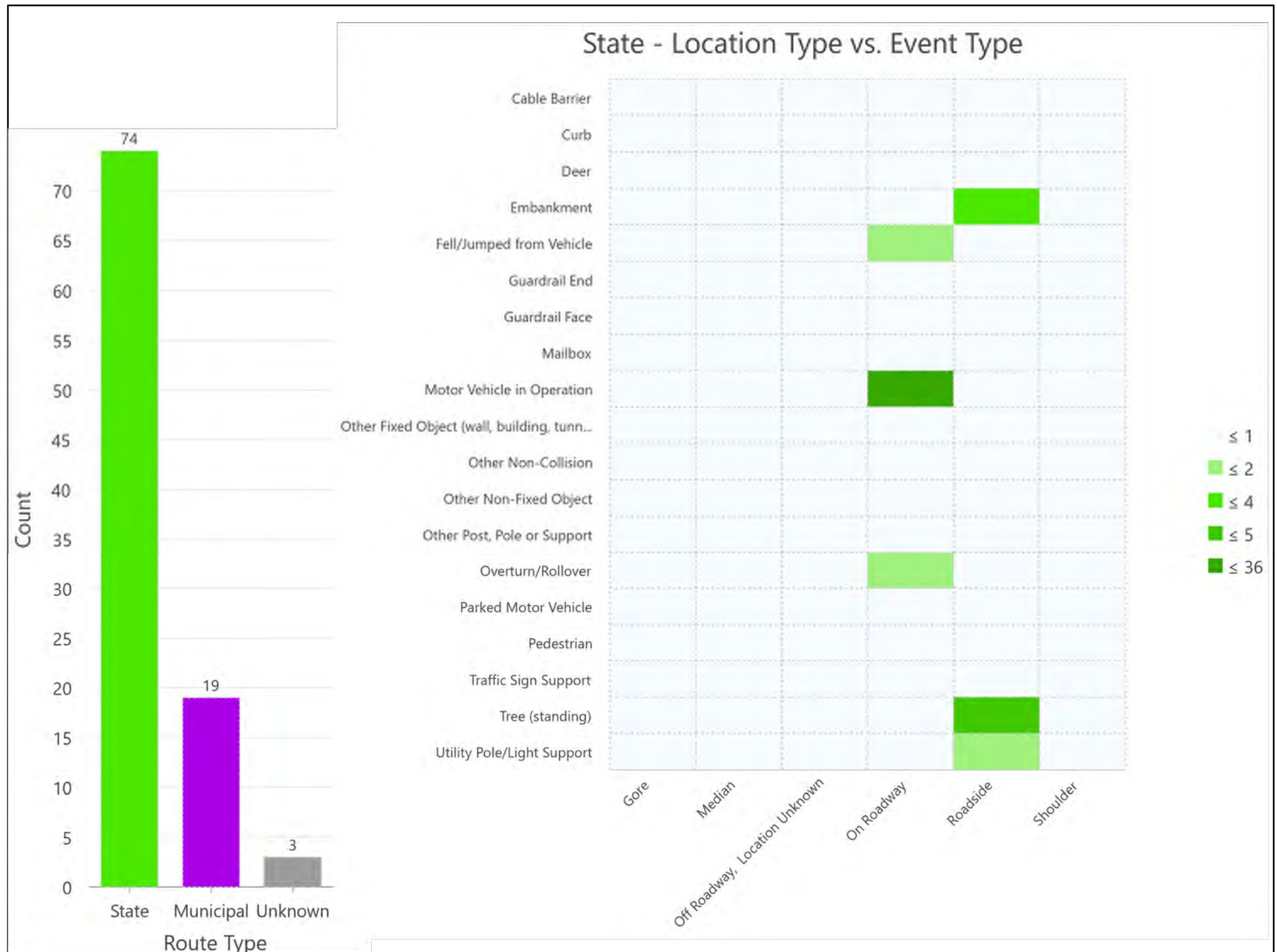
Northeast CT Rural vs. Urban K&A Crash Data 2018-2020

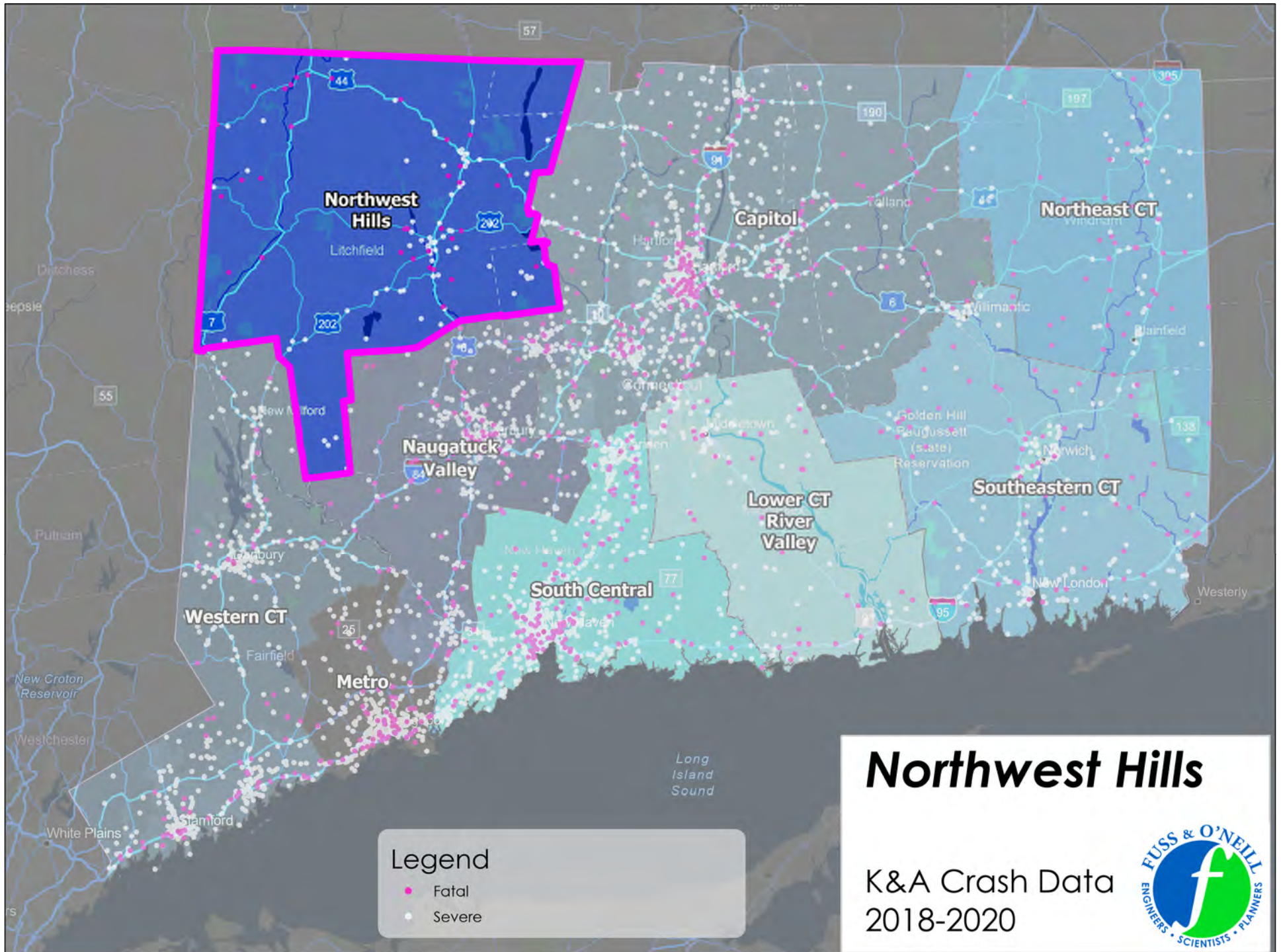


Northeast CT State vs. Municipal Road K&A Crash Data 2018-2020

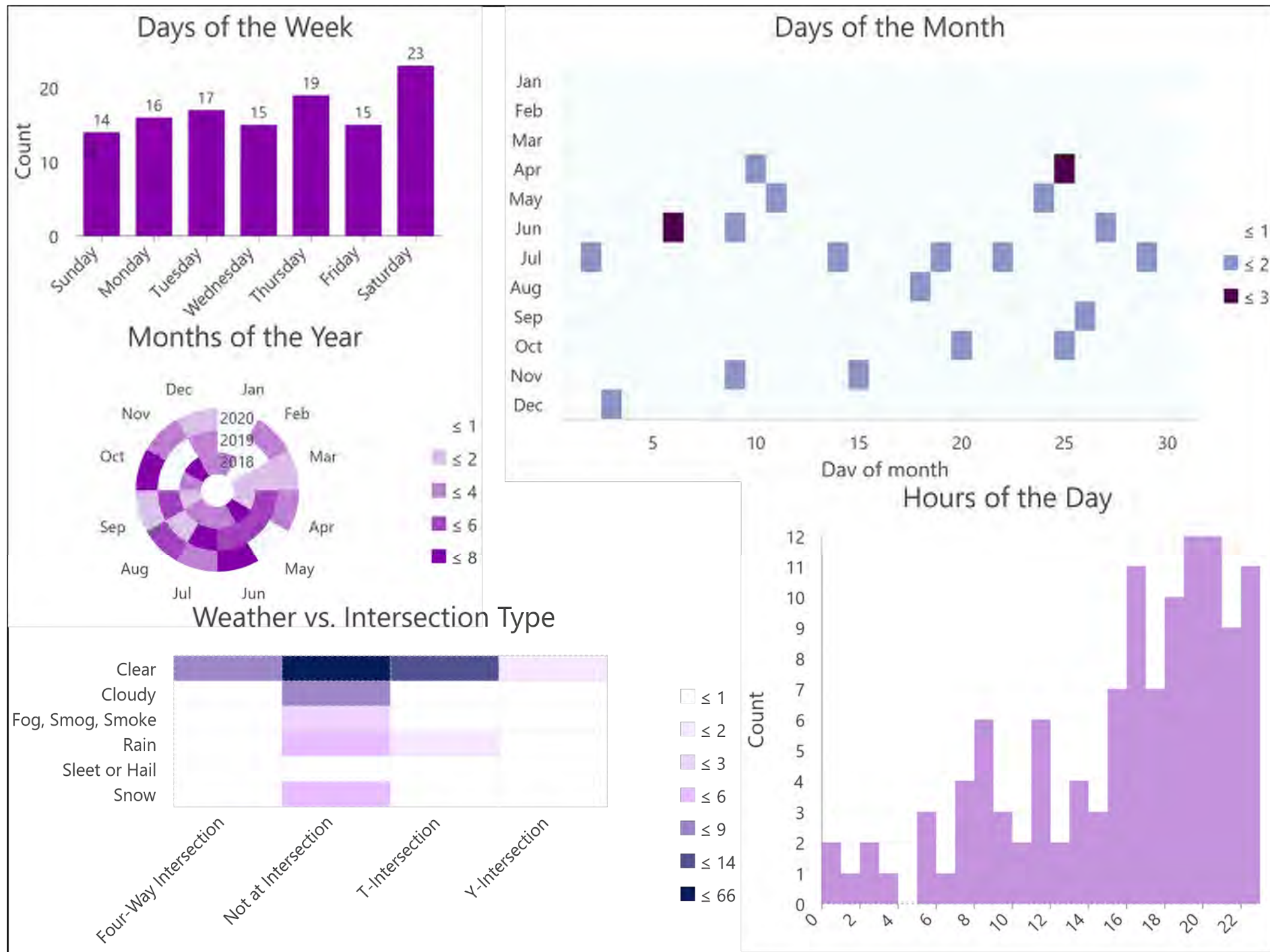


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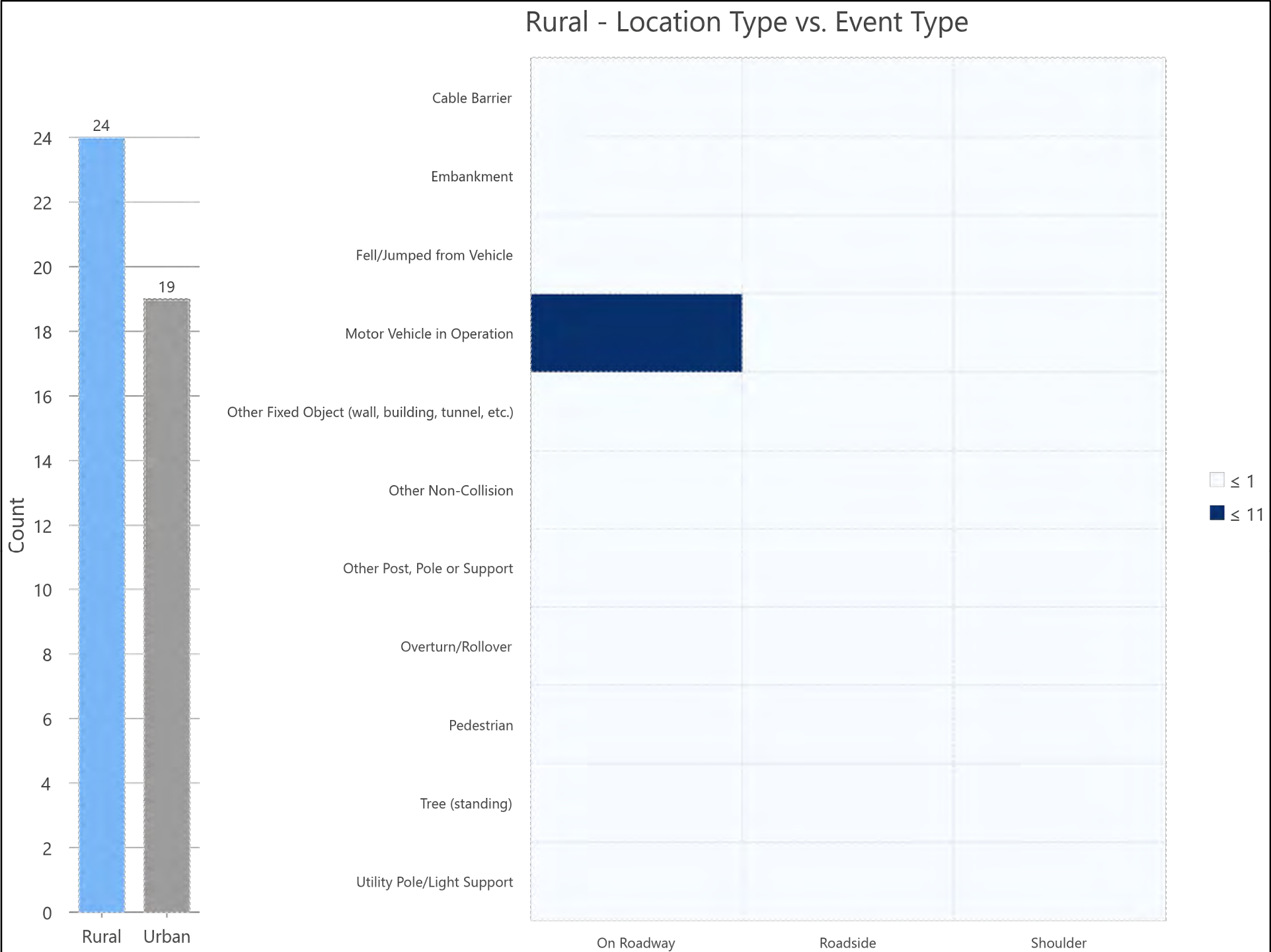




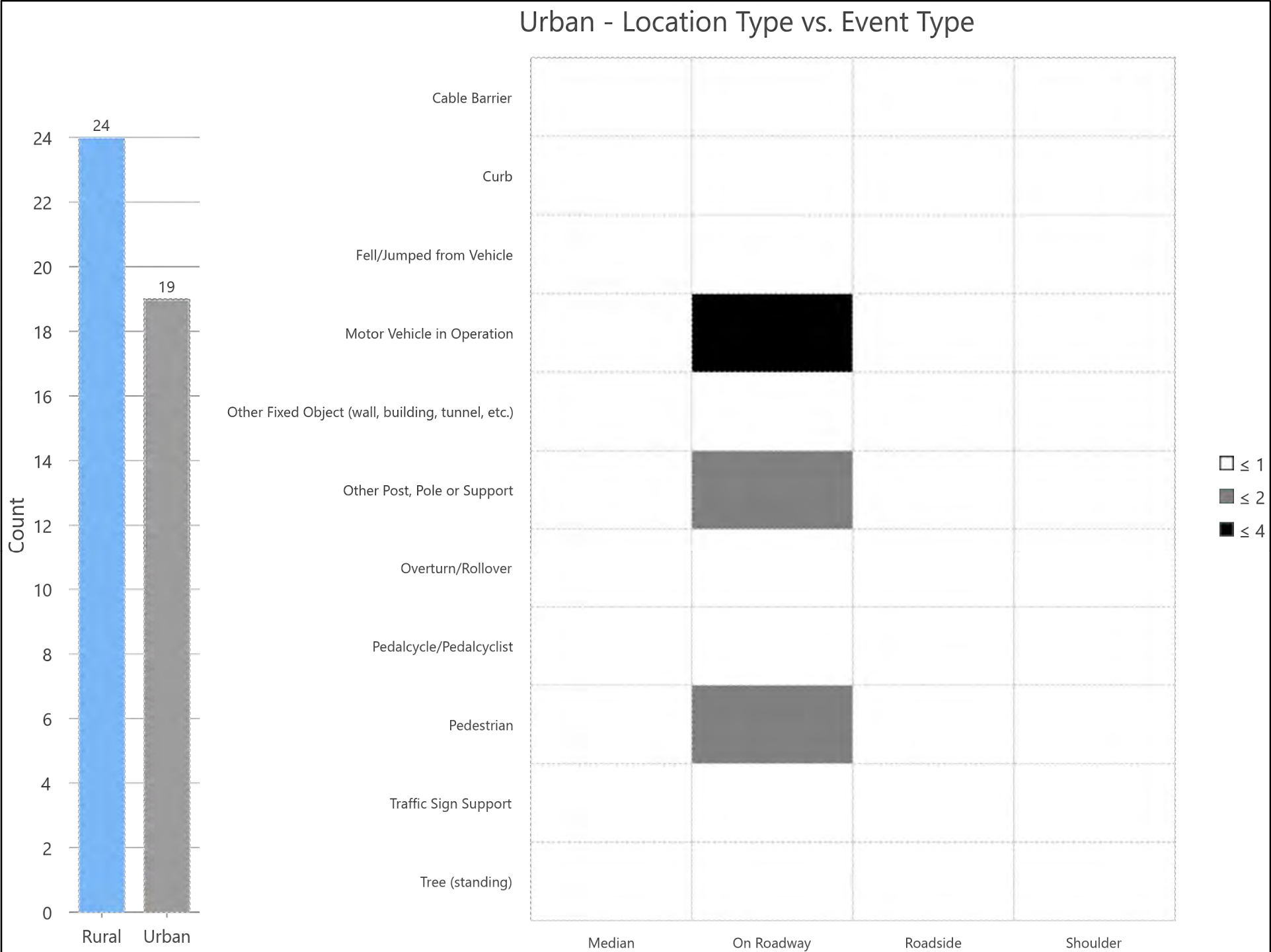
Northwest Hills Time & Conditions K&A Crash Data 2018-2020



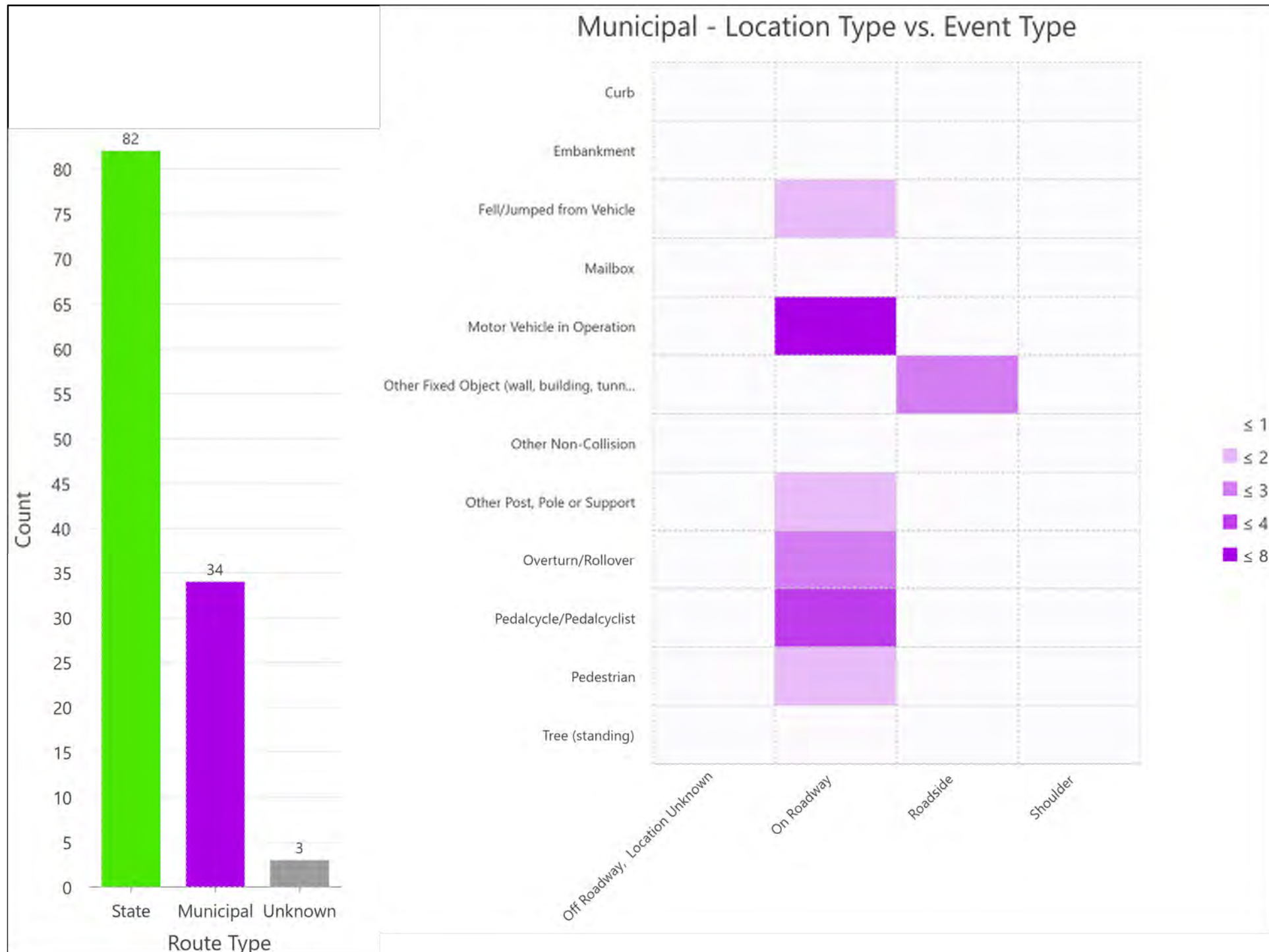
Northwest Hills Rural vs. Urban K&A Crash Data 2018-2020



Northwest Hills Rural vs. Urban K&A Crash Data 2018-2020

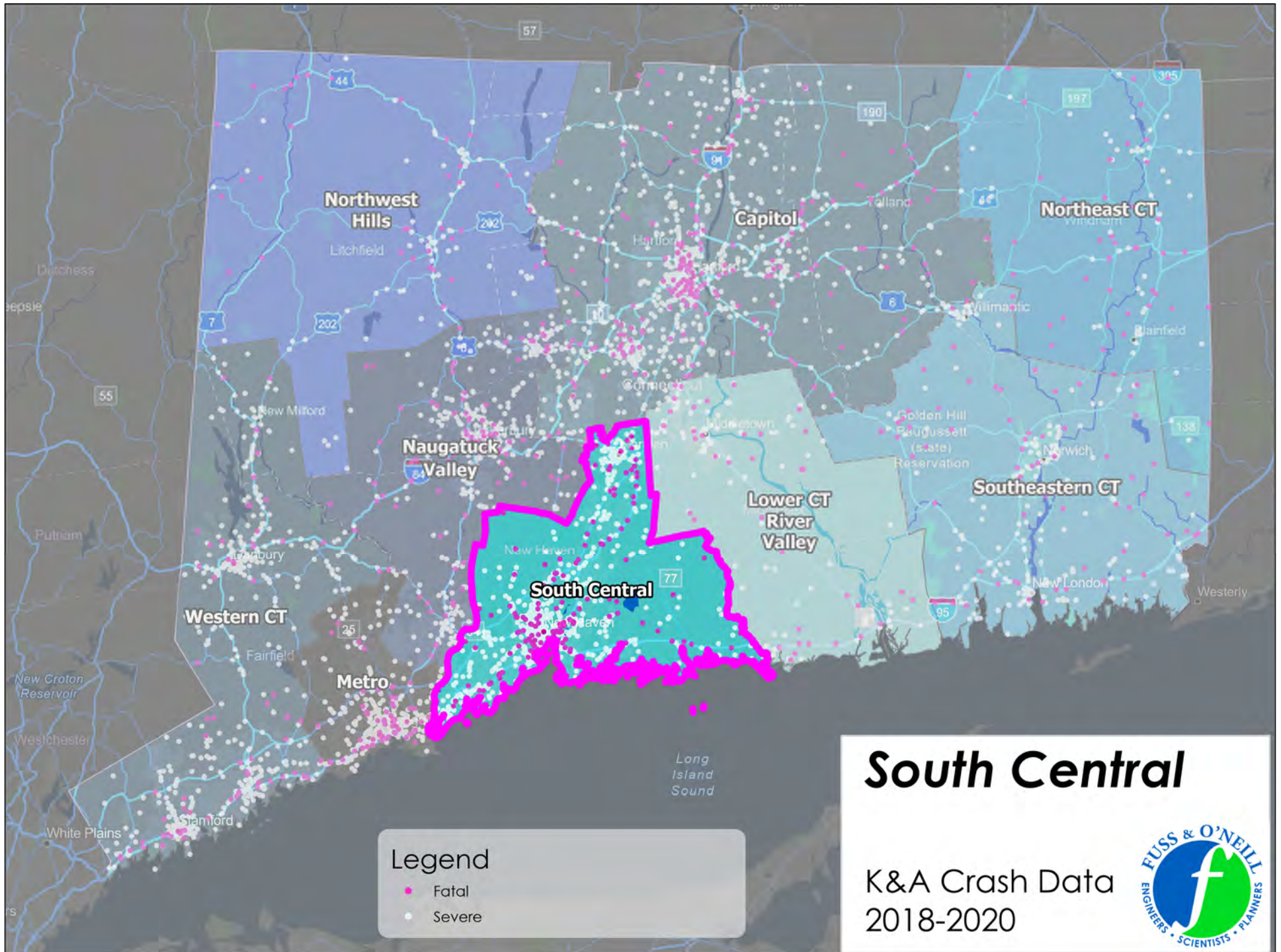


Northwest Hills State vs. Municipal Road K&A Crash Data 2018-2020

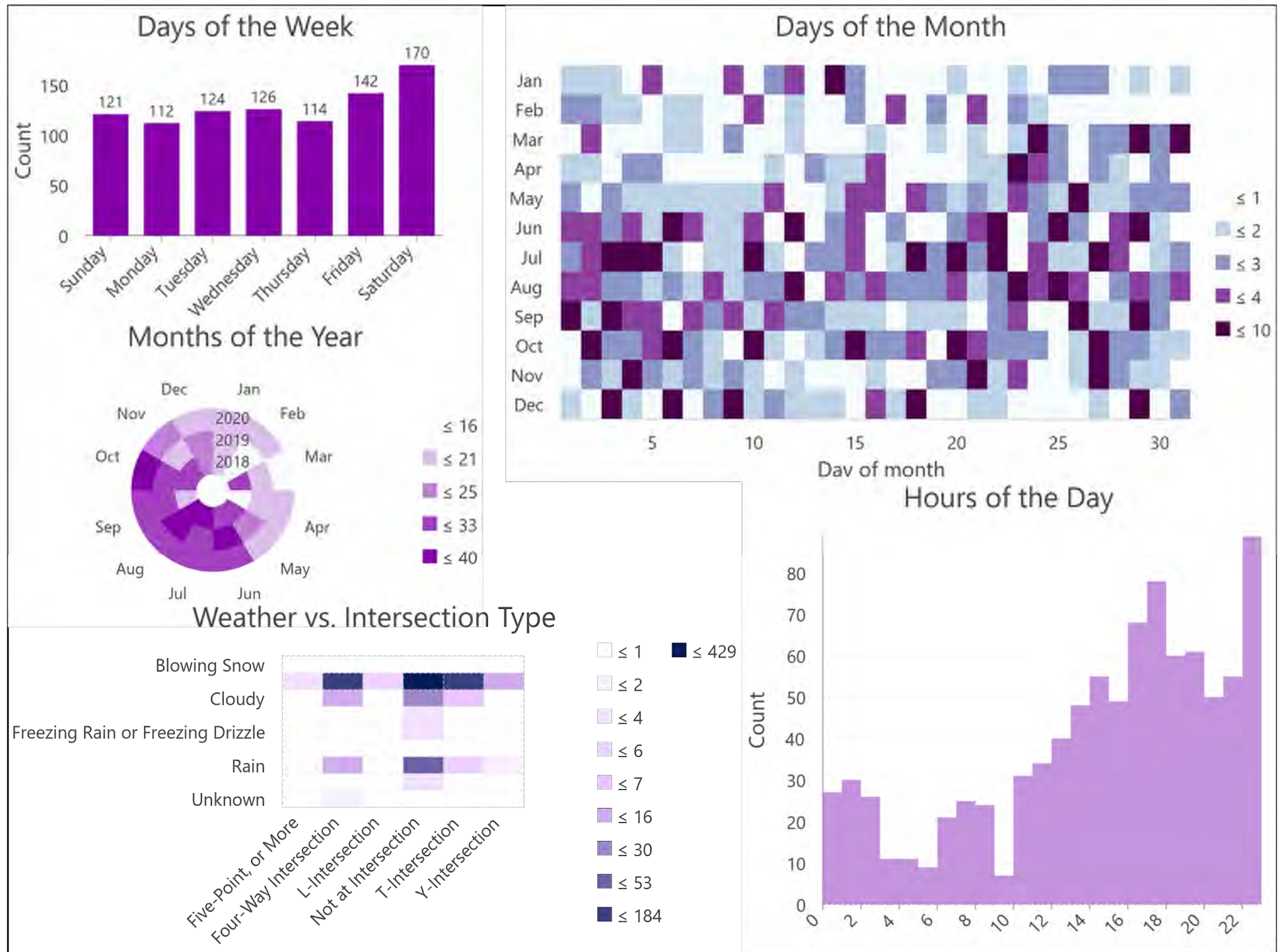


Northwest Hills State vs. Municipal Road K&A Crash Data 2018-2020





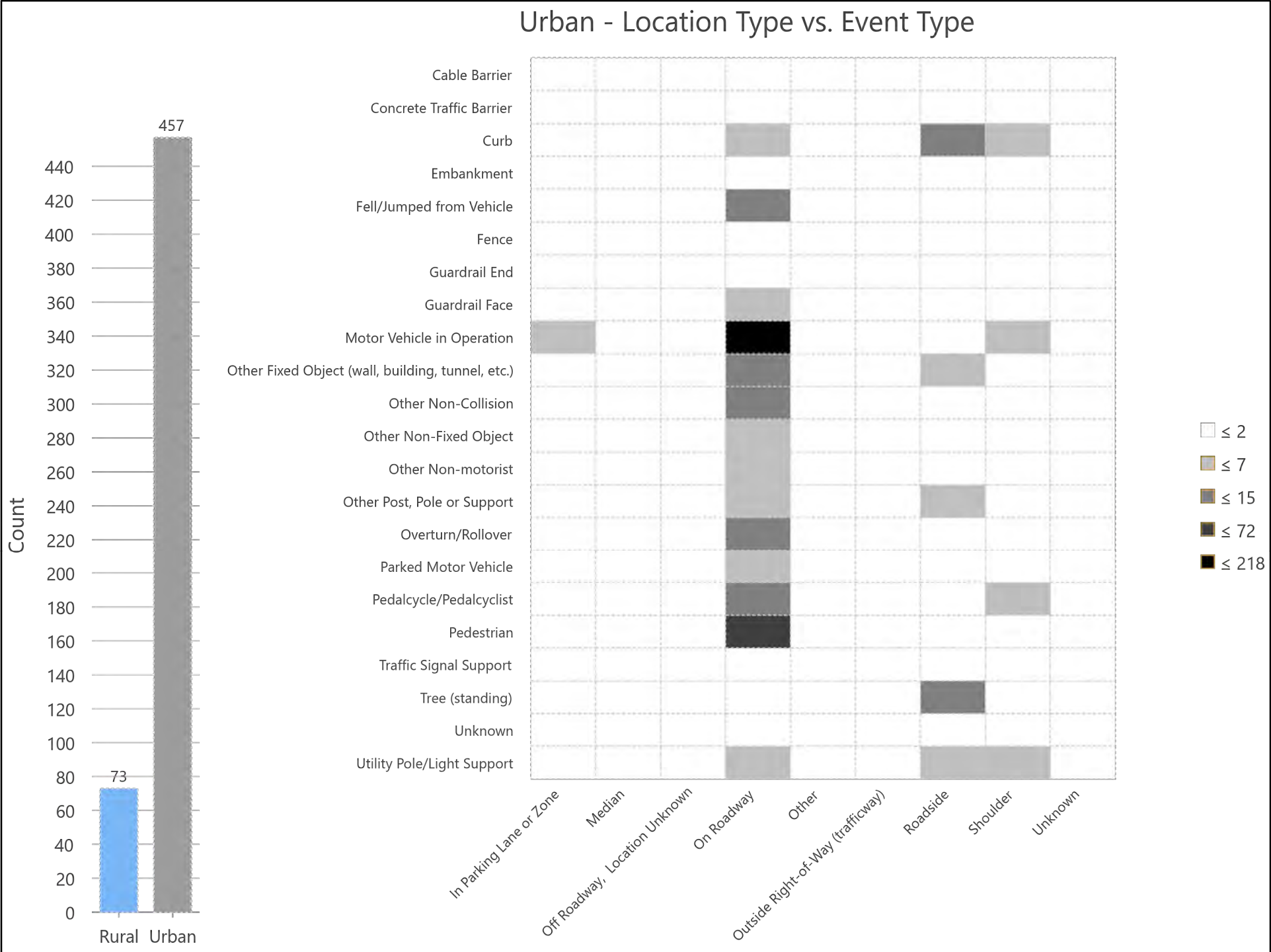
South Central Time & Conditions K&A Crash Data 2018-2020



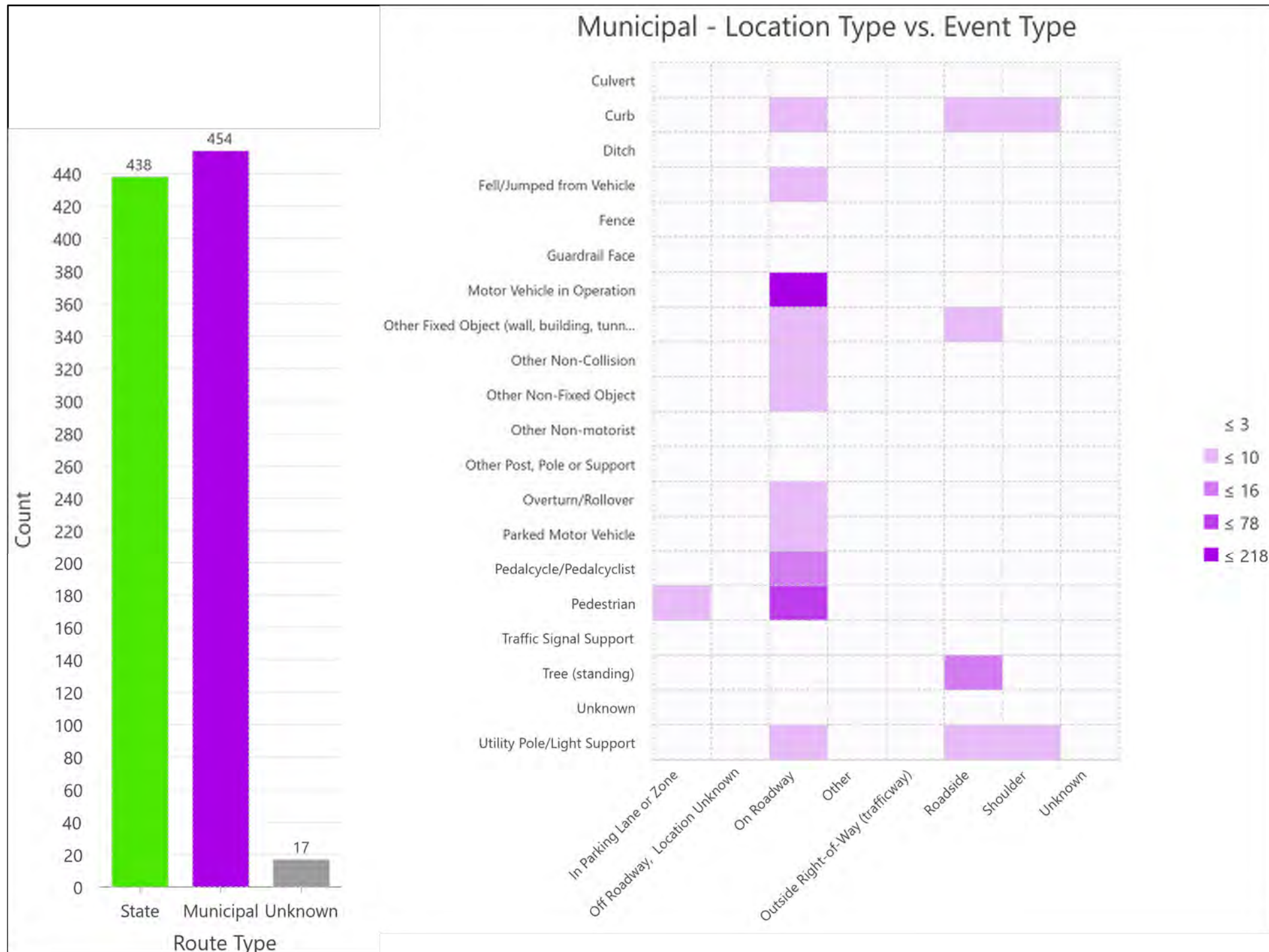
South Central Rural vs. Urban K&A Crash Data 2018-2020



South Central Rural vs. Urban K&A Crash Data 2018-2020

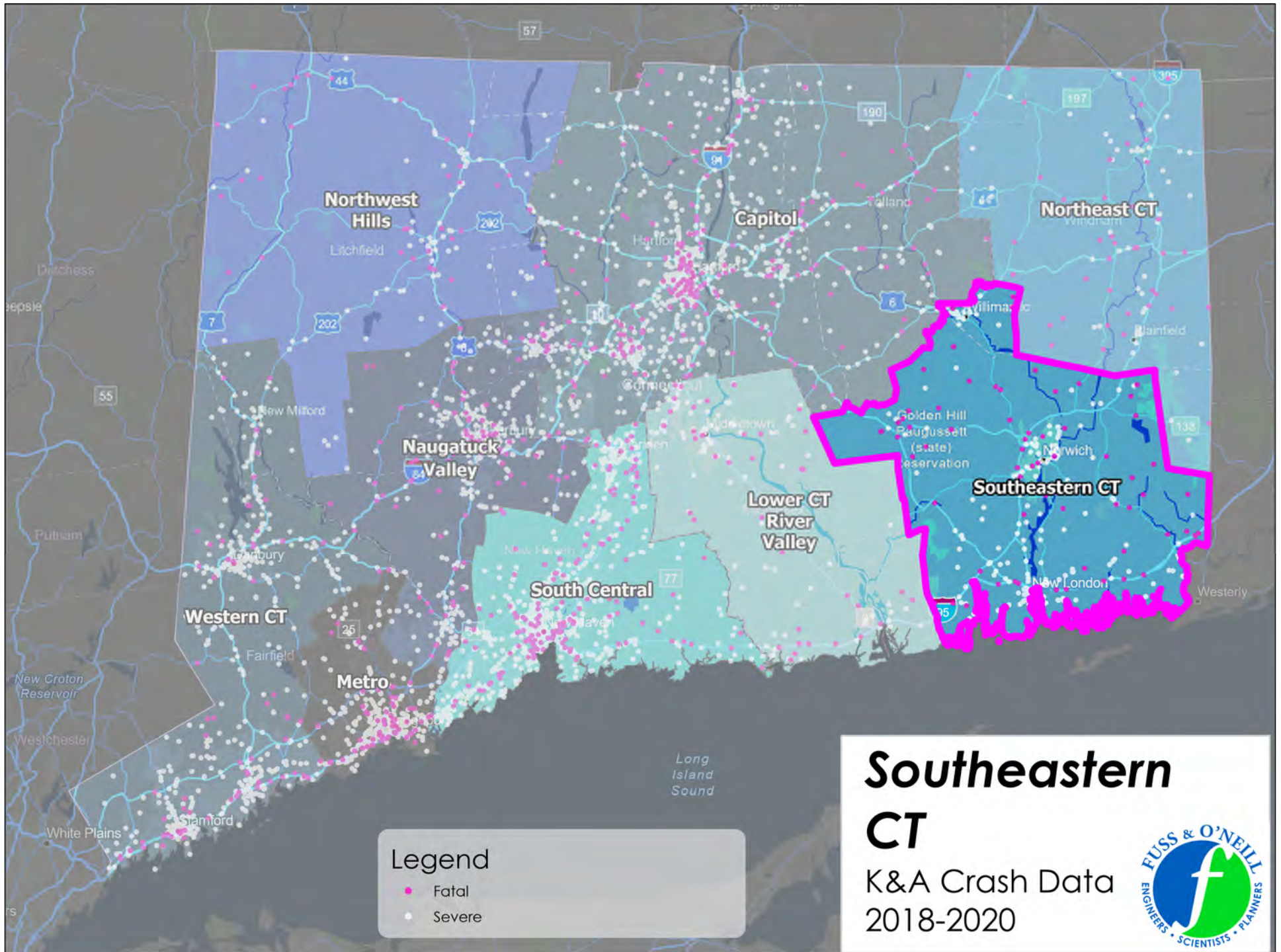


South Central State vs. Municipal Road K&A Crash Data 2018-2020

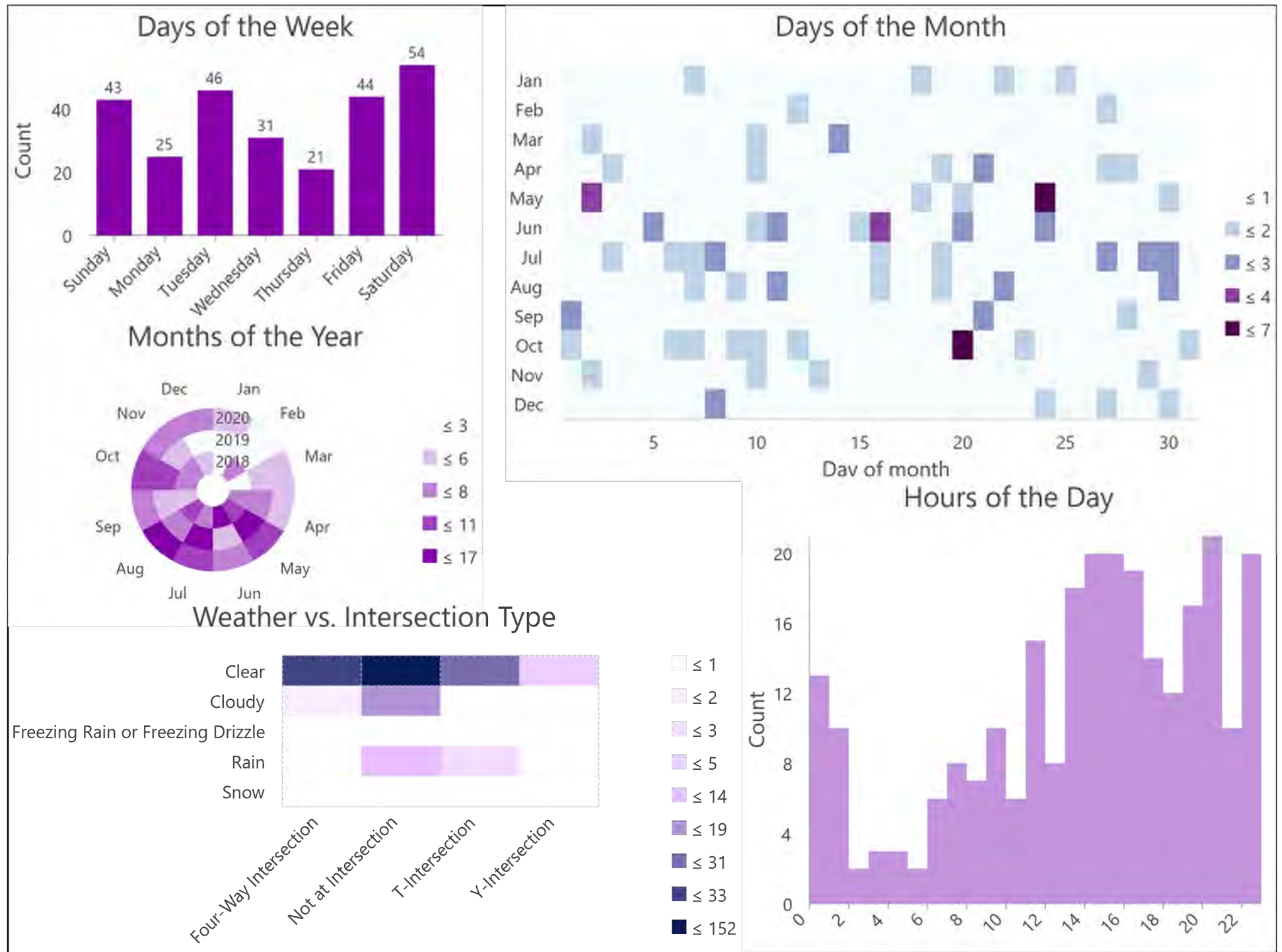


South Central State vs. Municipal Road K&A Crash Data 2018-2020





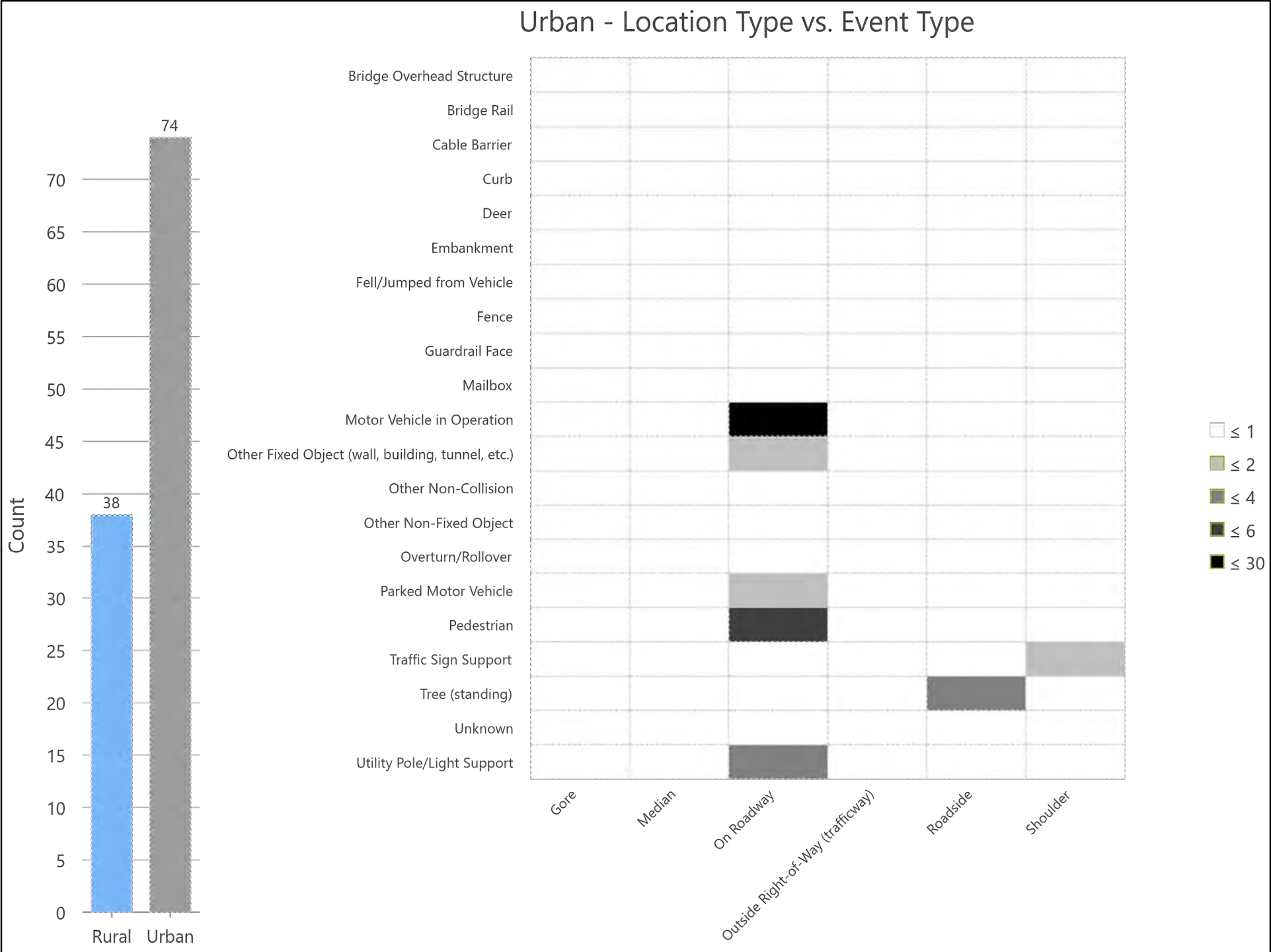
Southeastern CT Time & Conditions K&A Crash Data 2018-2020



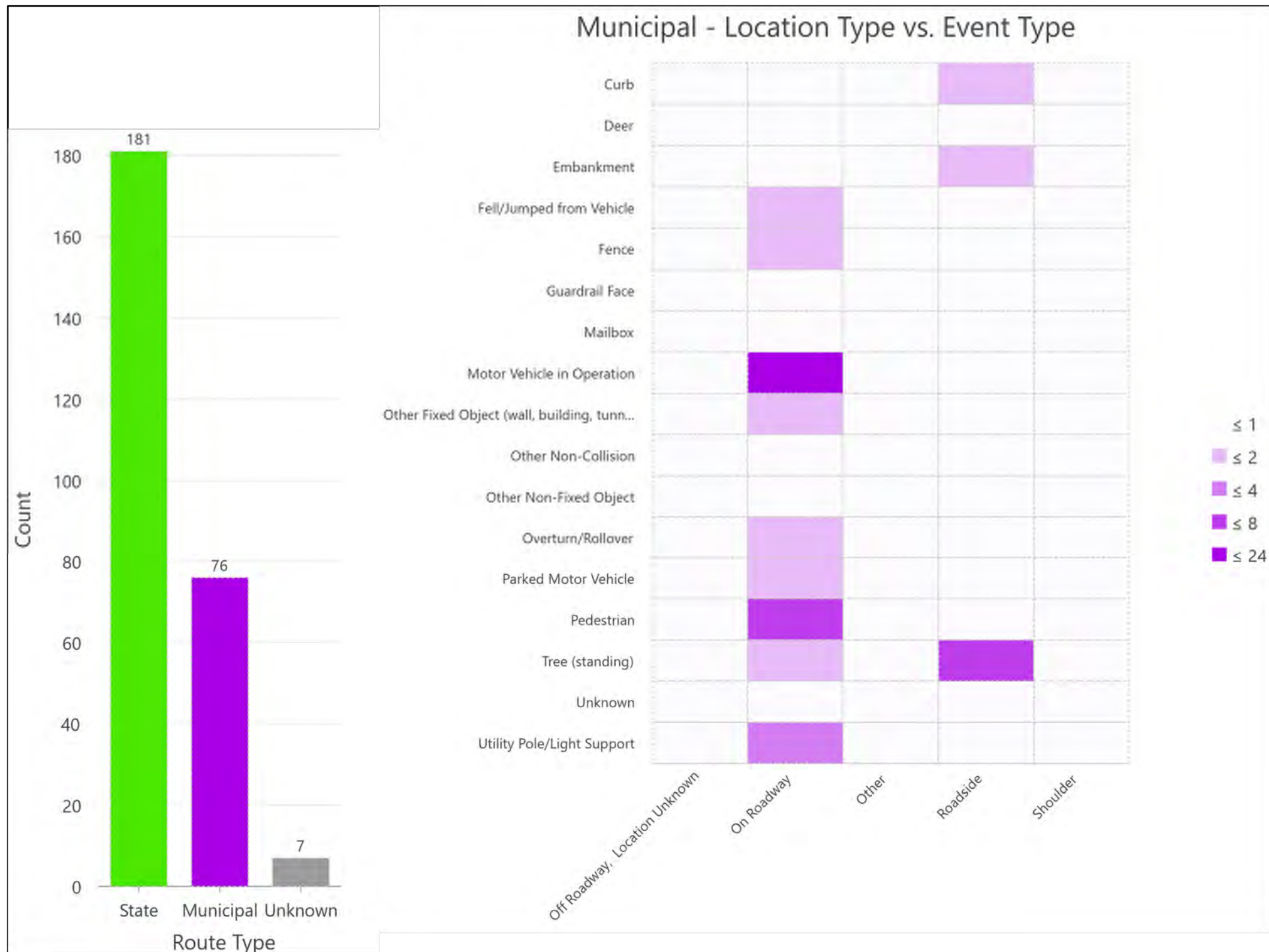
Southeastern CT Rural vs. Urban K&A Crash Data 2018-2020



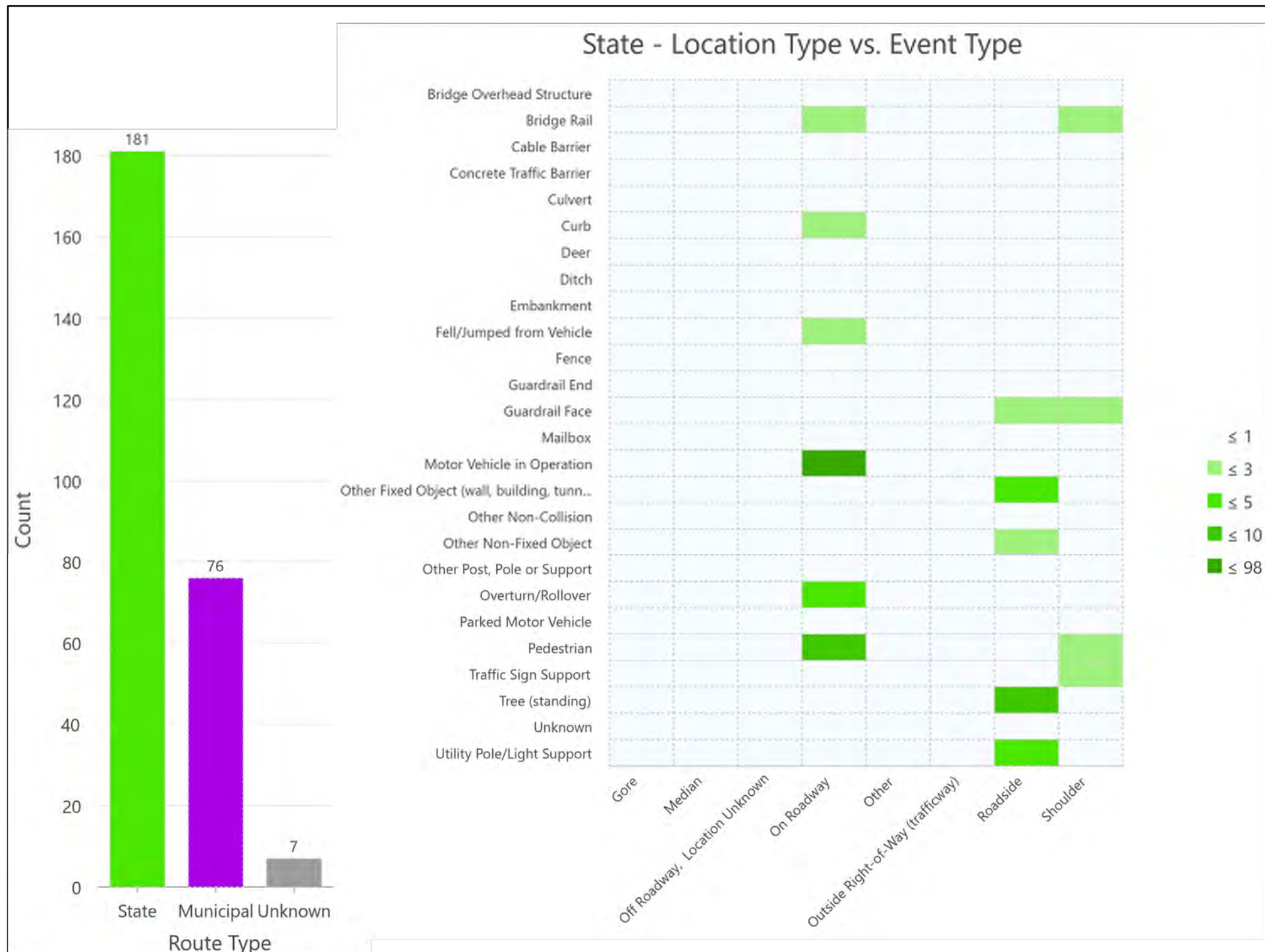
Southeastern CT Rural vs. Urban K&A Crash Data 2018-2020

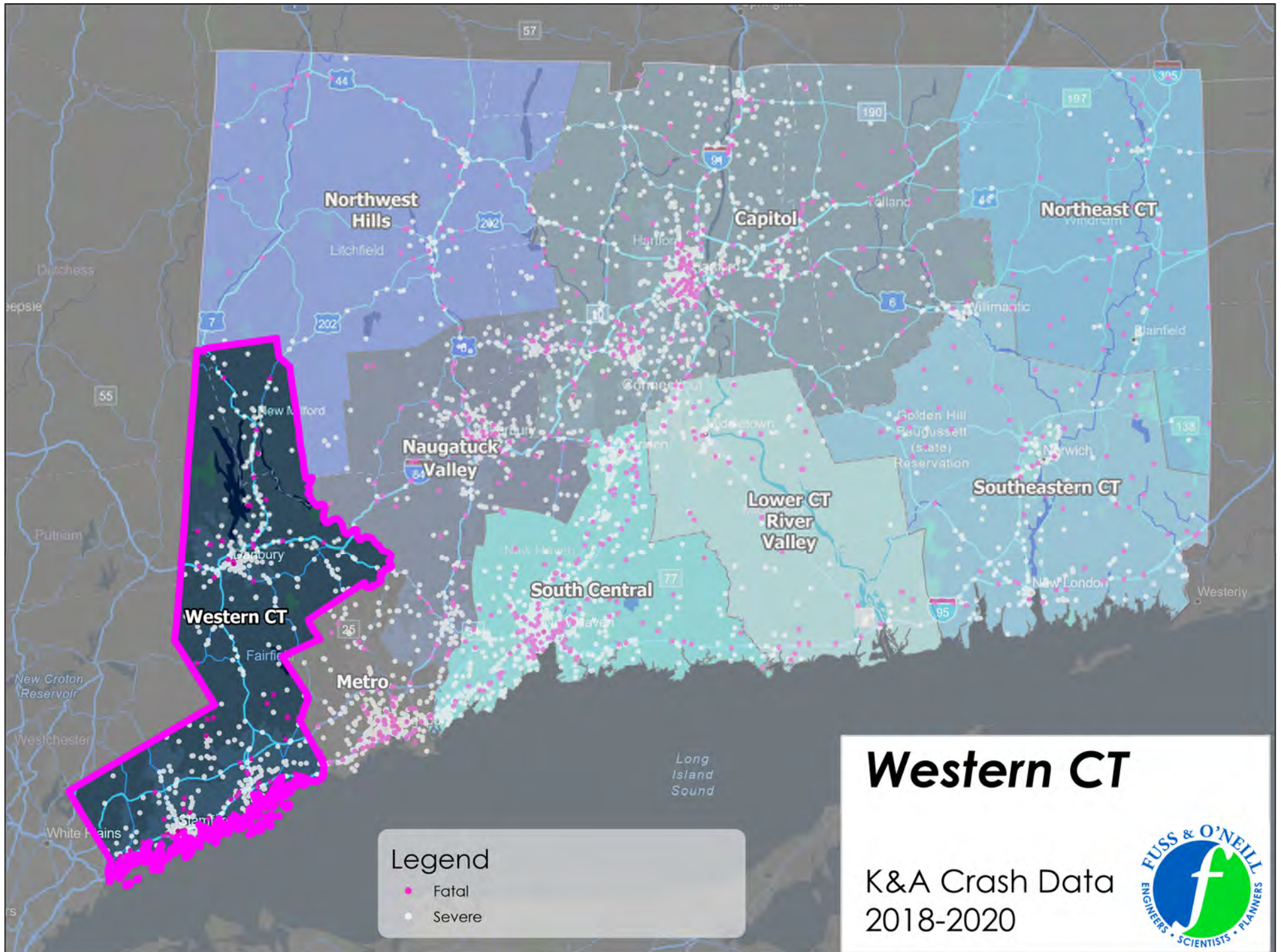


Southeastern CT State vs. Municipal Road K&A Crash Data 2018-2020

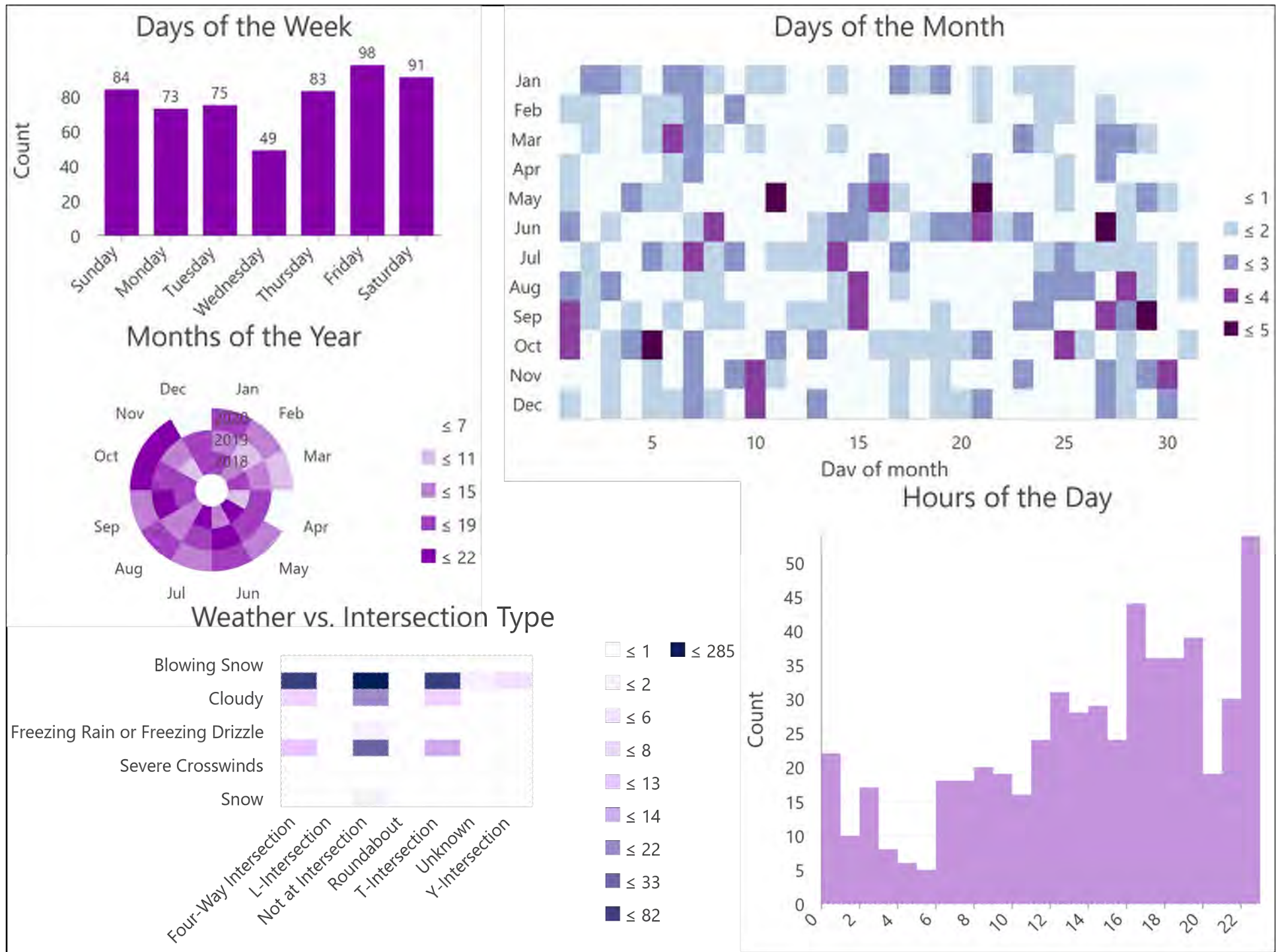


Southeastern CT State vs. Municipal Road K&A Crash Data 2018-2020

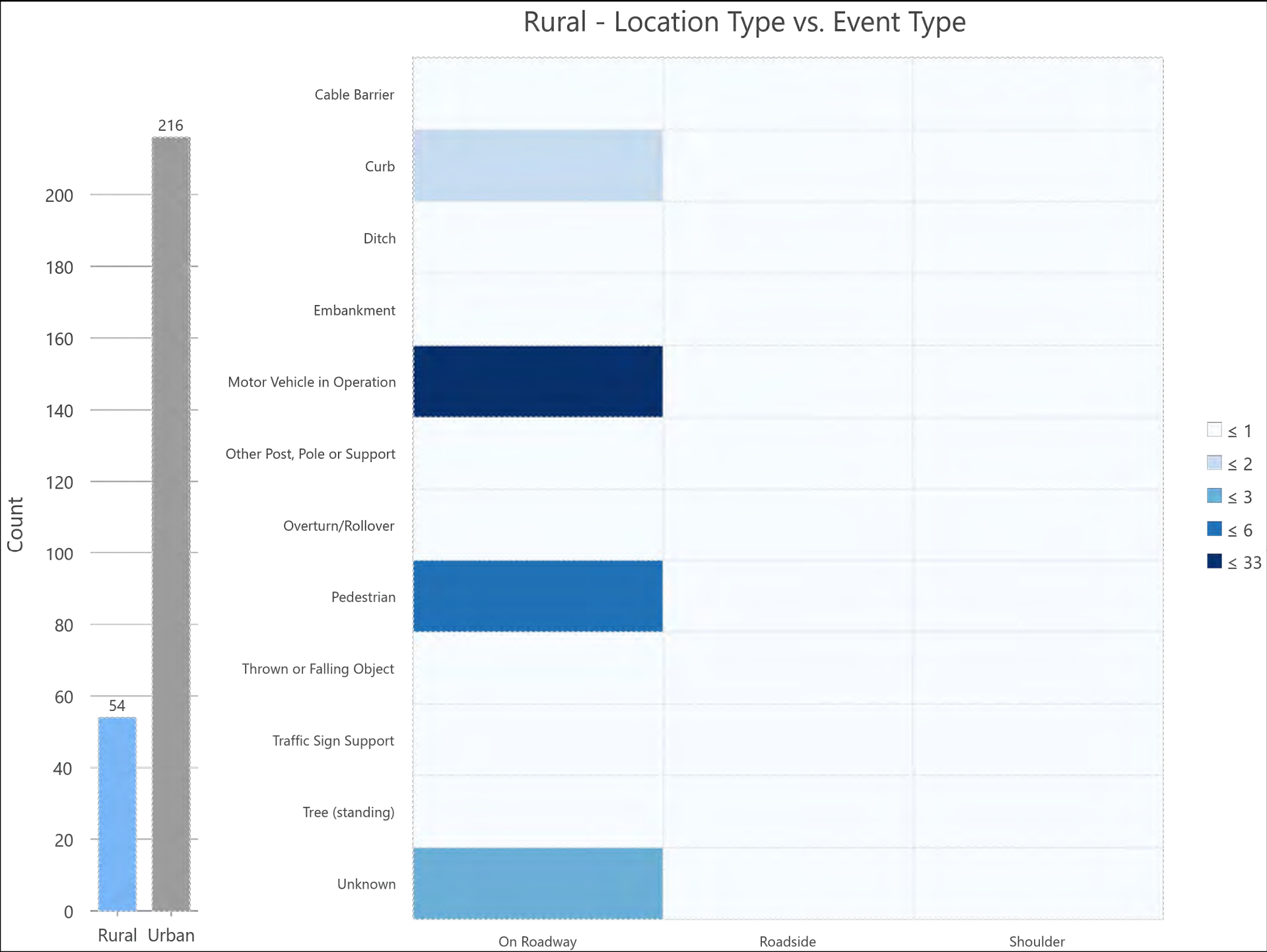




Western CT Time & Conditions K&A Crash Data 2018-2020



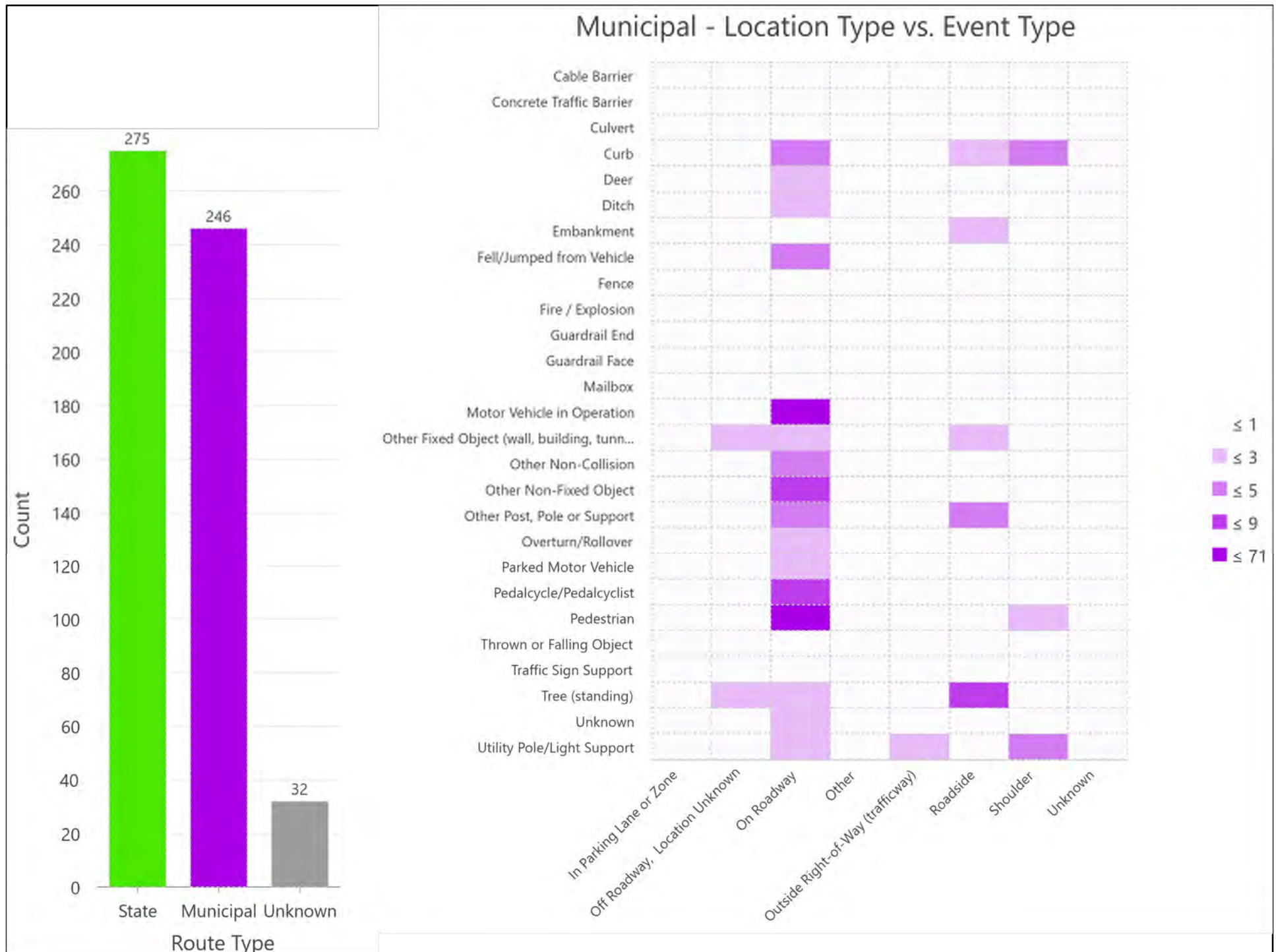
Western CT Rural vs. Urban K&A Crash Data 2018-2020



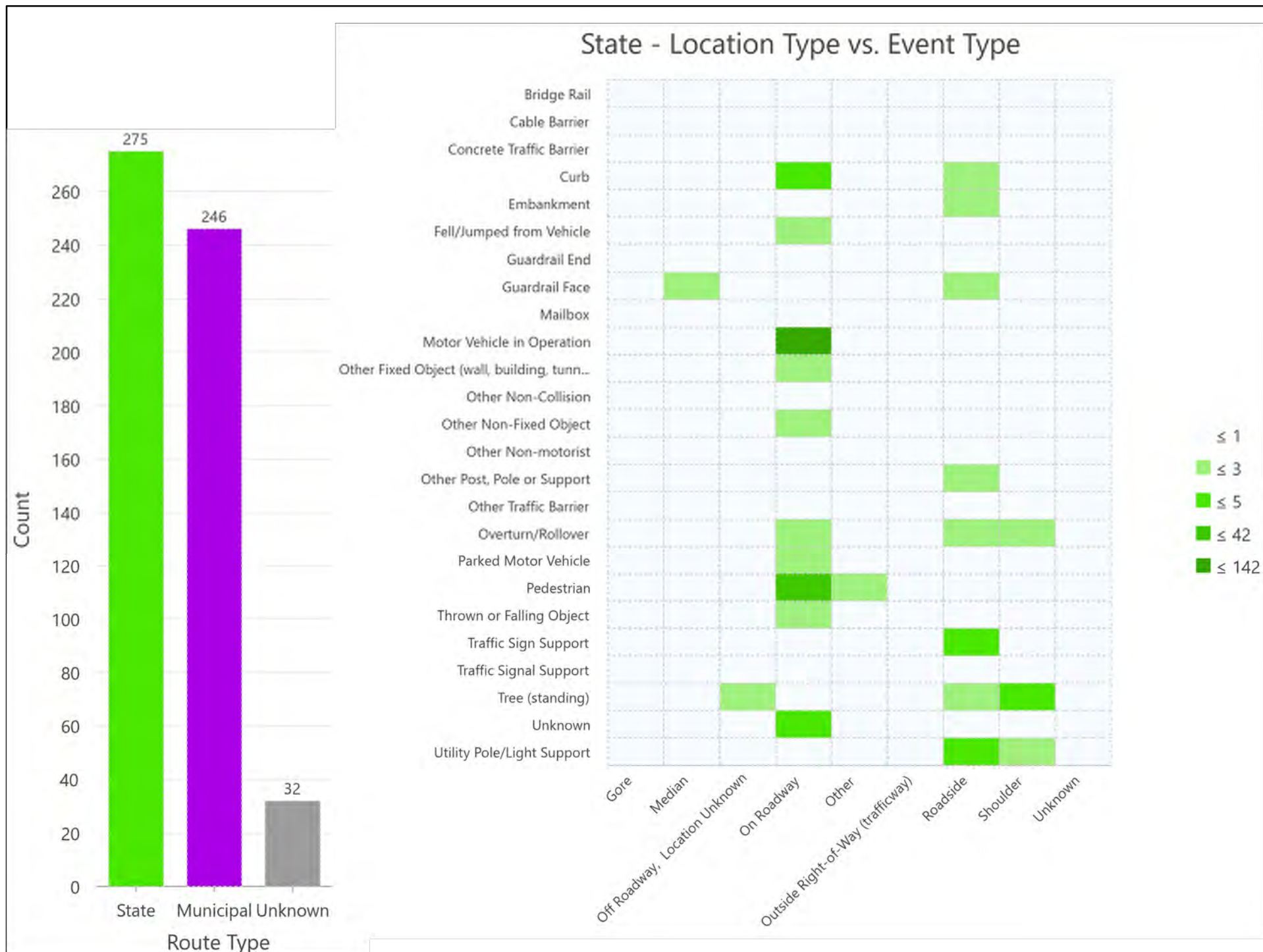
Western CT Rural vs. Urban K&A Crash Data 2018-2020



Western CT State vs. Municipal Road K&A Crash Data 2018-2020



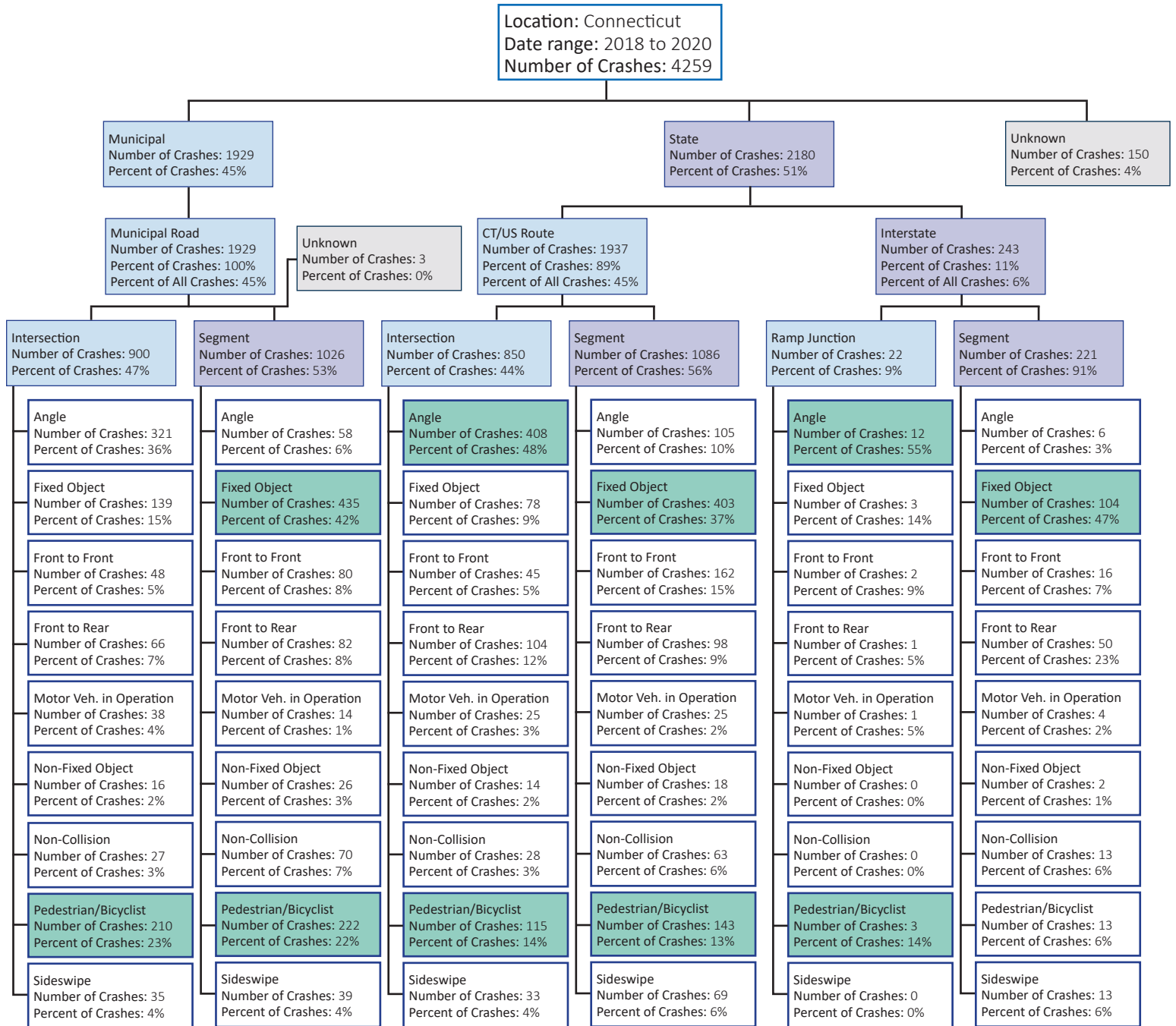
Western CT State vs. Municipal Road K&A Crash Data 2018-2020



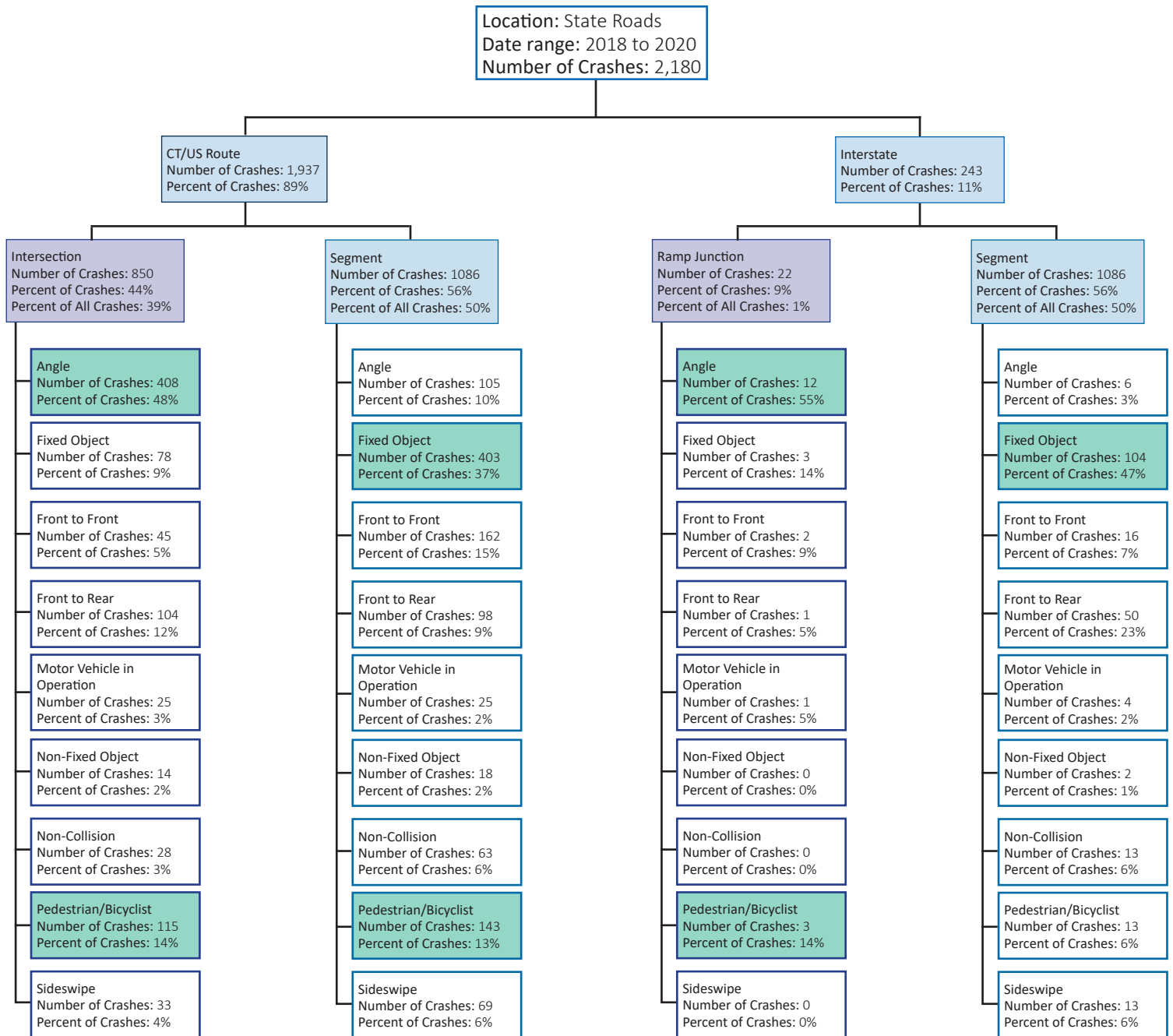
Appendix E

Crash Trees

Connecticut Fatal and Serious Injury Crash Tree

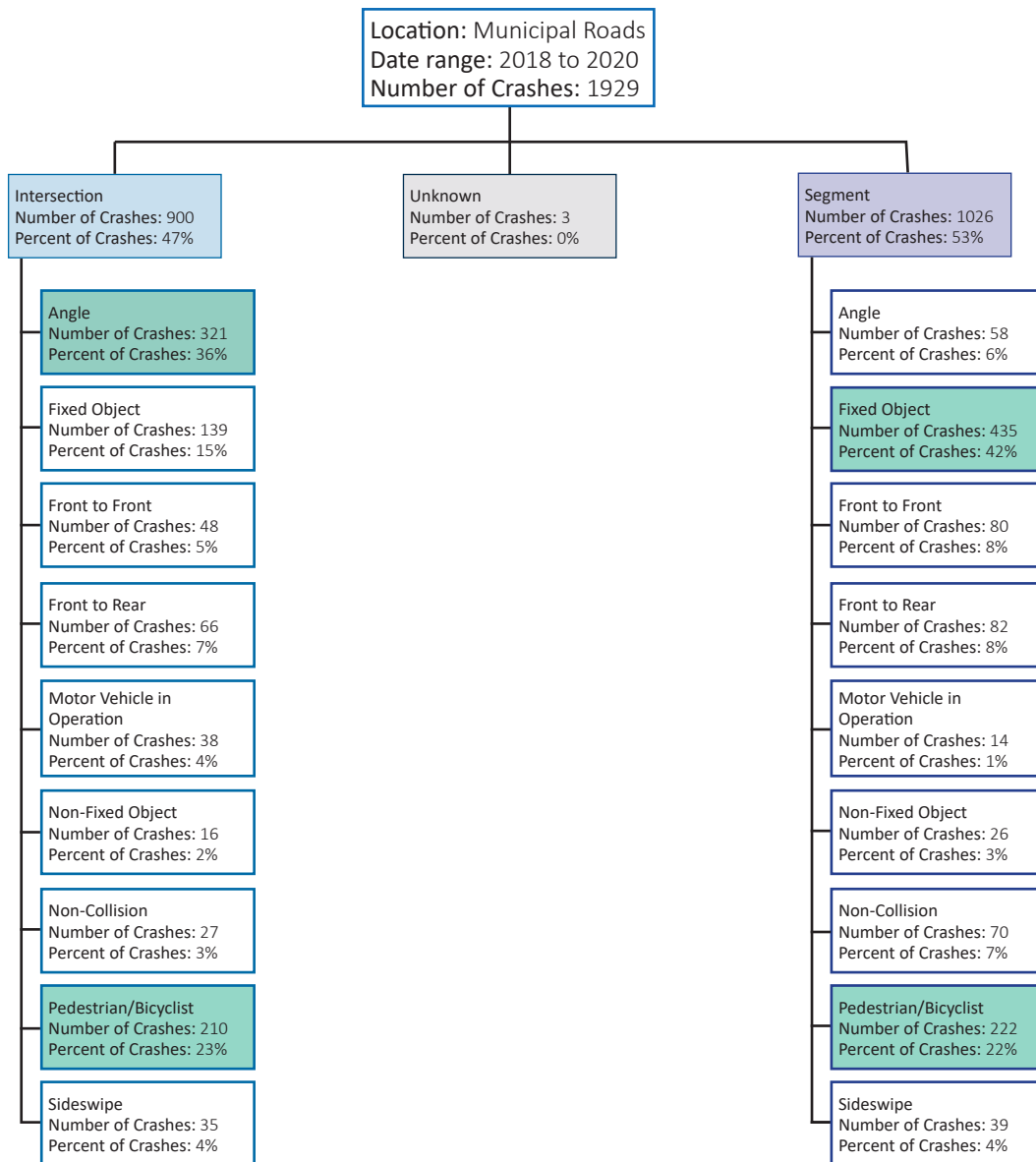


Connecticut Intersection Vs Segment Fatal and Serious Injury Crash Tree

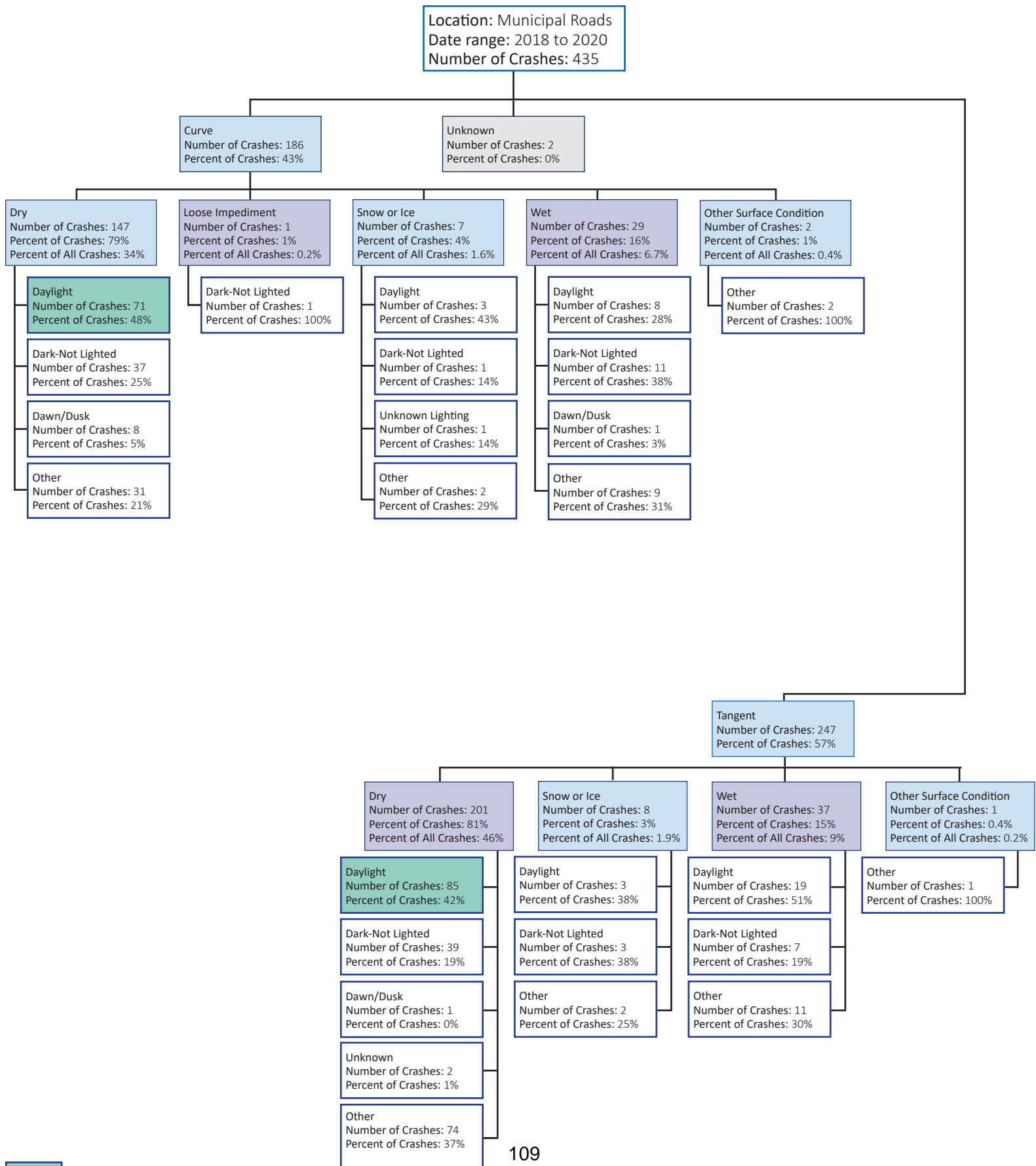


Municipal Intersection Vs. Segment & Crash Type

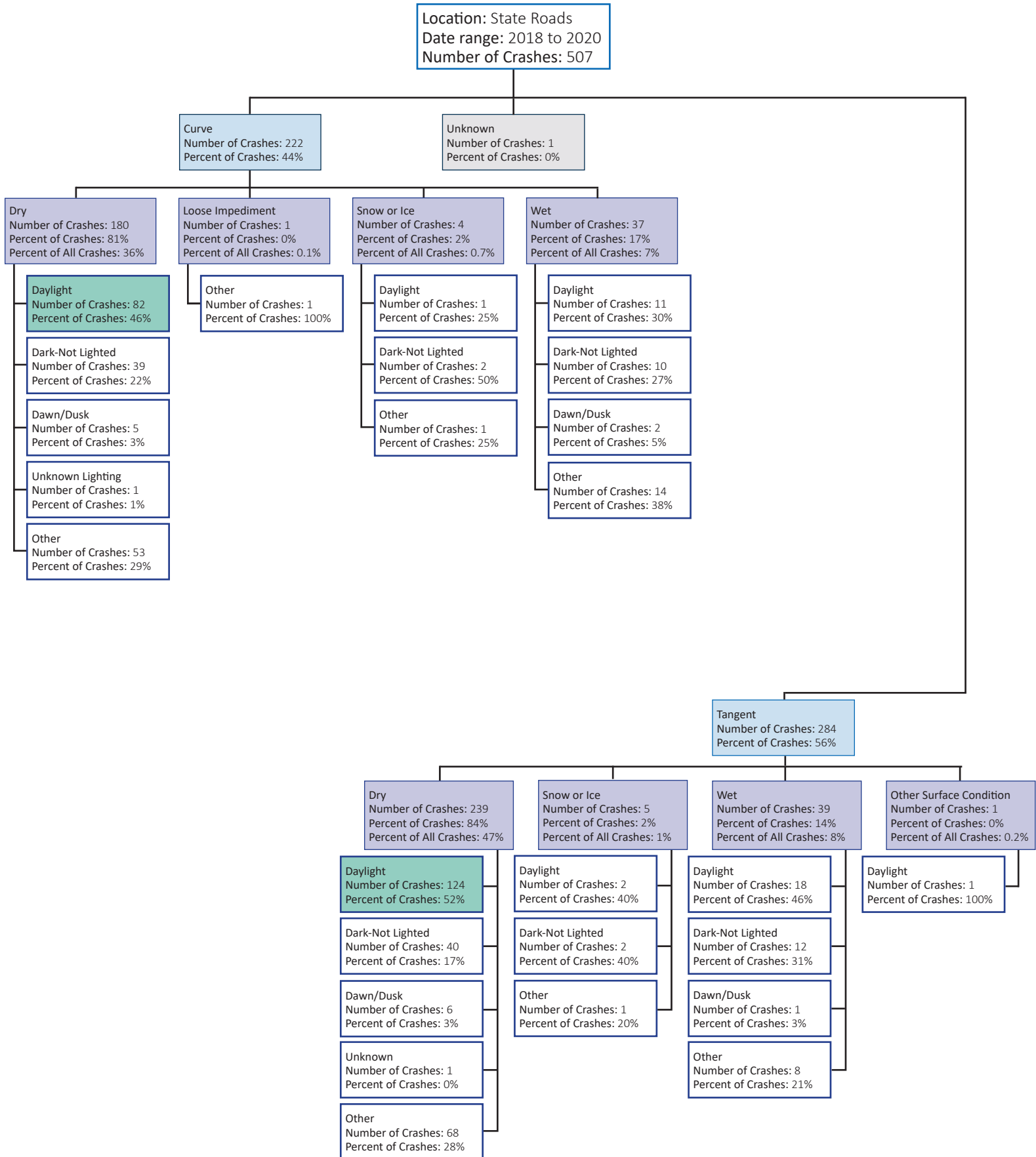
Fatal and Serious Injury Crash Tree



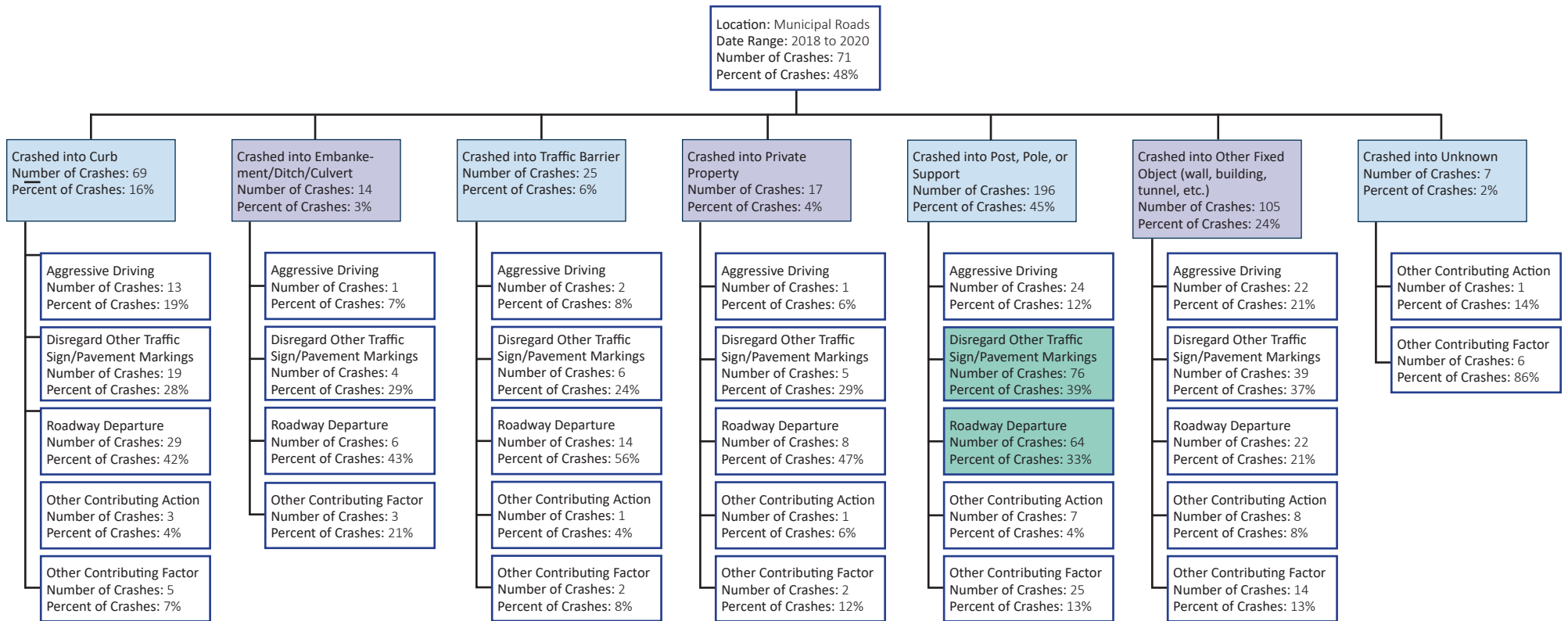
Municipal Fatal and Serious Injury Fixed Object Segment Crash Tree



Connecticut Fatal and Serious Injury Fixed Object Segment Crash

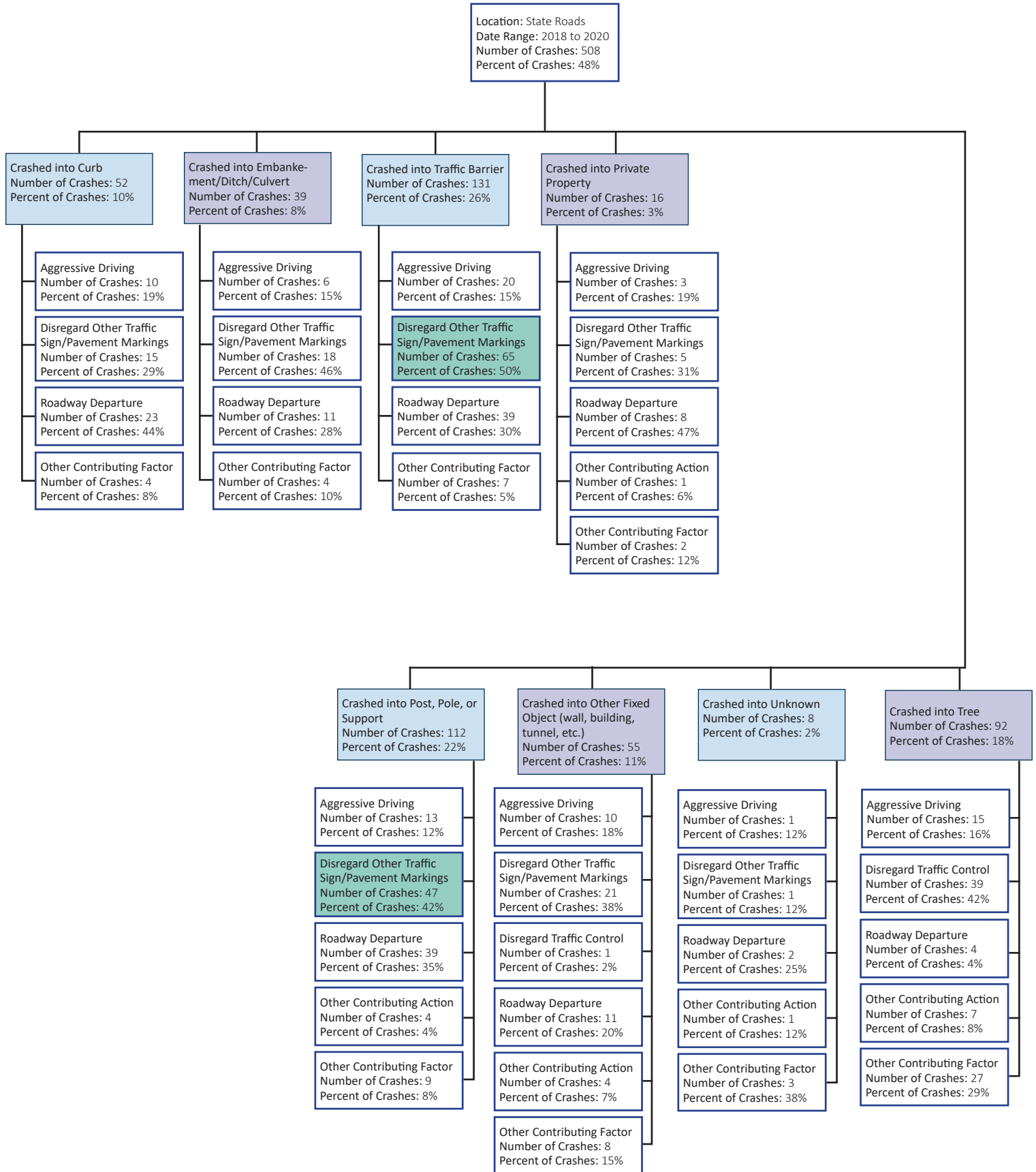


Municipal Fixed Object Classification Fatal and Serious Injury Crash Tree



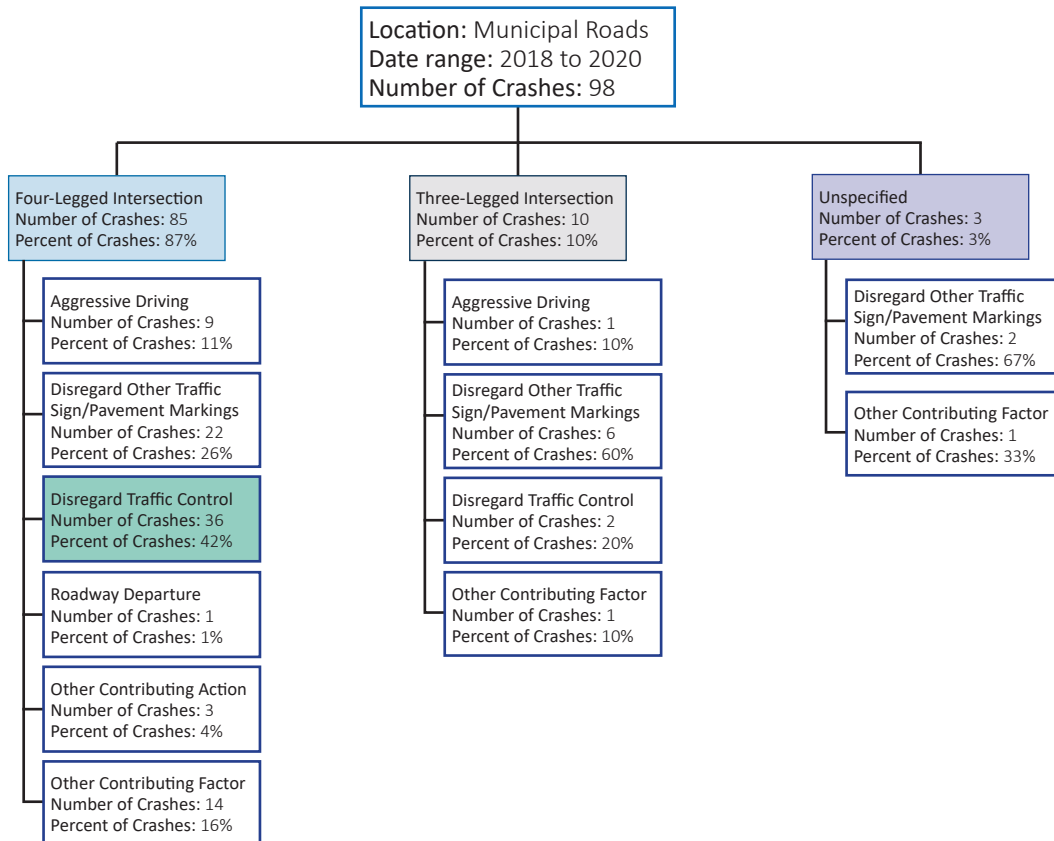
State Fixed Object Classification

Fatal and Serious Injury Crash Tree

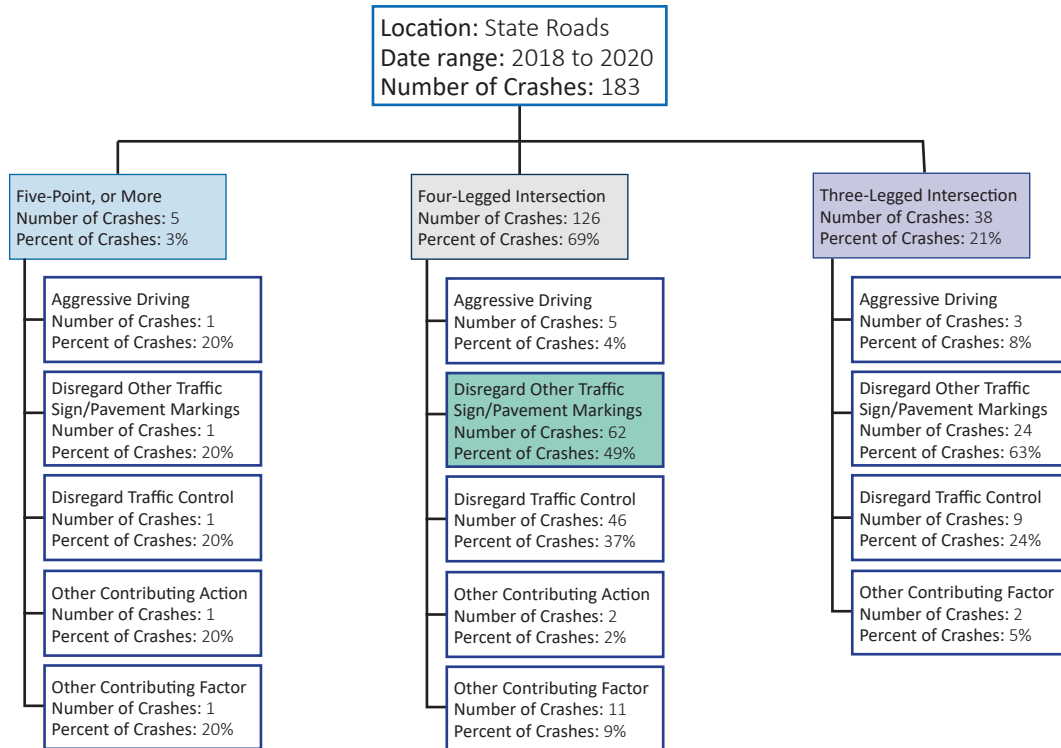


Municipal Signalized Angle Intersection Crashes (Top 10 Municipalities)

Fatal and Serious Injury Crash Tree



State Signalized Angle Crashes Fatal and Seroius Injury Crash Tree

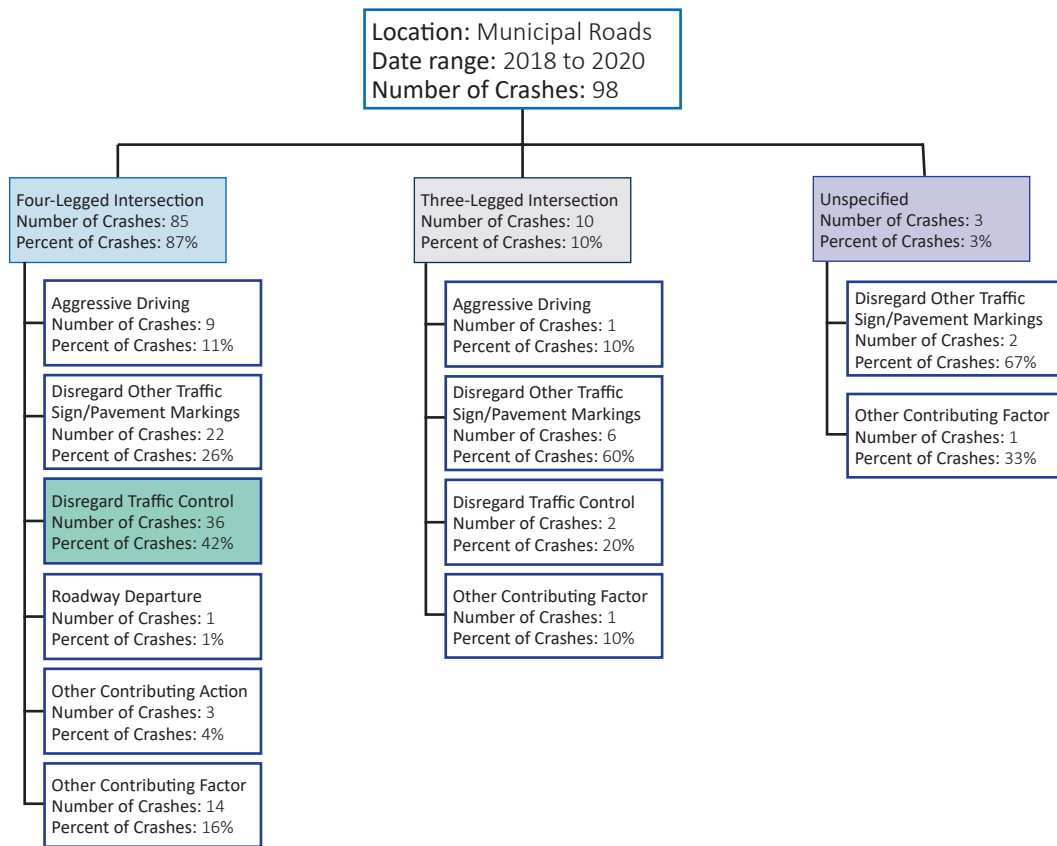


Fatal and Serious Injury Crash Rates by Municipality

Municipality	A	K	Total Crashes	Crash Percent
Hartford	51	14	65	20%
New Haven	44	4	48	15%
Bridgeport	42	3	45	14%
Waterbury	18	1	19	6%
Meriden	13	1	14	4%
New Britain	9	0	9	3%
Stamford	8	0	8	2%
Fairfield	7	1	8	2%
Manchester	7	0	7	2%
Enfield	6	1	7	2%
Milford	6	0	6	2%
West Haven	5	1	6	2%
West Hartford	5	0	5	2%
Middletown	5	0	5	2%
East Hartford	5	0	5	2%
Norwalk	4	0	4	1%
Hamden	4	0	4	1%
Bristol	4	0	4	1%
Stratford	3	0	3	1%
North Haven	3	0	3	1%
Greenwich	3	0	3	1%
Danbury	2	1	3	1%
Windsor	2	0	2	1%
Wethersfield	2	0	2	1%
Westport	2	0	2	1%
Wallingford	2	0	2	1%
Torrington	2	0	2	1%
South Windsor	2	0	2	1%
Norwich	2	0	2	1%
Newington	2	0	2	1%
Glastonbury	2	0	2	1%
Bethel	2	0	2	1%
Brookfield	1	1	2	1%
Windham	1	0	1	<1%
Watertown	1	0	1	<1%
Waterford	1	0	1	<1%
Vernon	1	0	1	<1%
Southington	1	0	1	<1%
Shelton	1	0	1	<1%
Rocky Hill	1	0	1	<1%
Putnam	1	0	1	<1%
North Branford	1	0	1	<1%
Newtown	1	0	1	<1%
New London	1	0	1	<1%
Madison	1	0	1	<1%
Farmington	1	0	1	<1%
Ellington	1	0	1	<1%
Berlin	1	0	1	<1%
Ansonia	1	0	1	<1%
Southbury	0	1	1	<1%
Orange	0	1	1	<1%
Total	291	30	321	100%

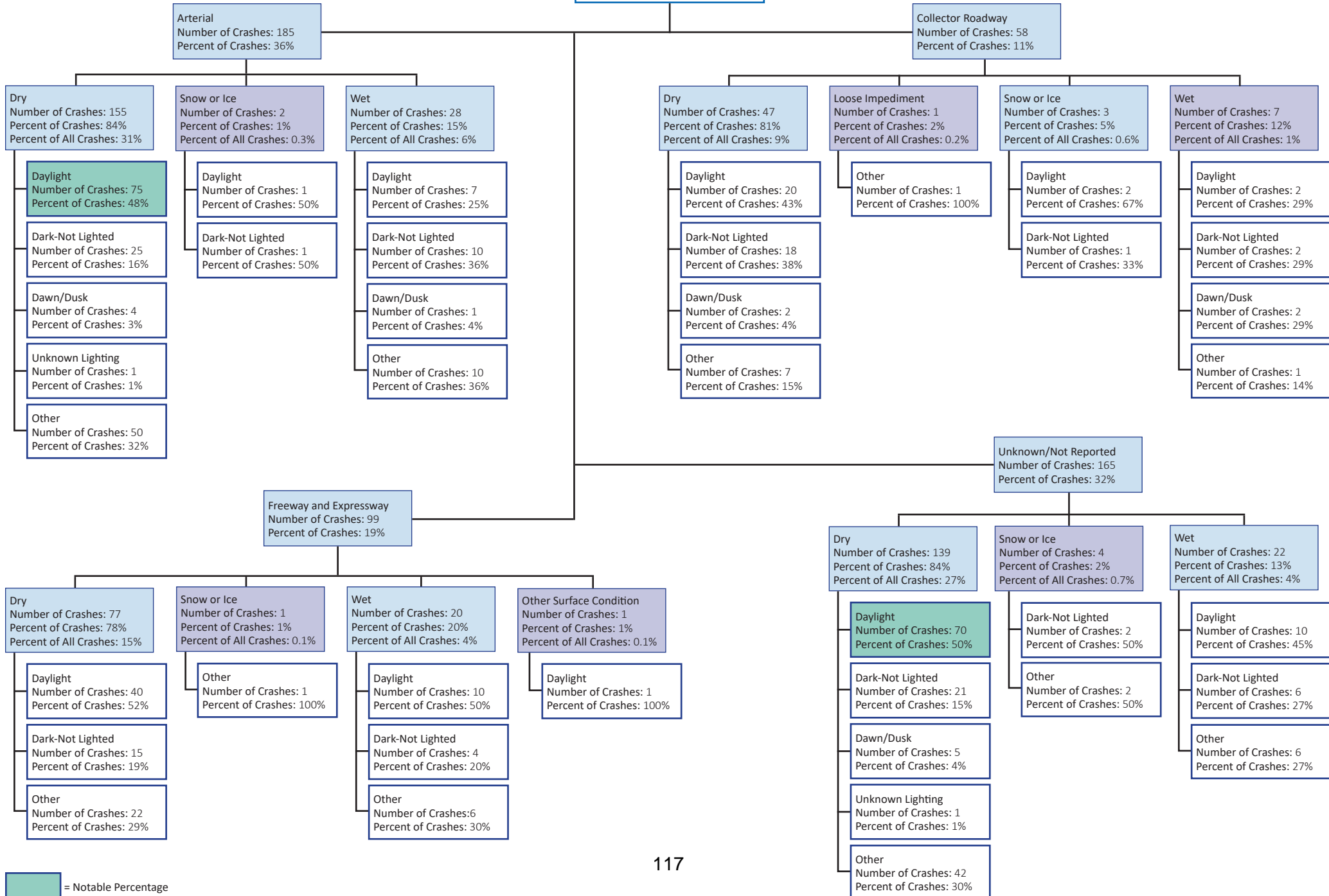
Top Ten Municipalities Angle Crashes at Intersection

Fatal and Serious Injury Crash Tree

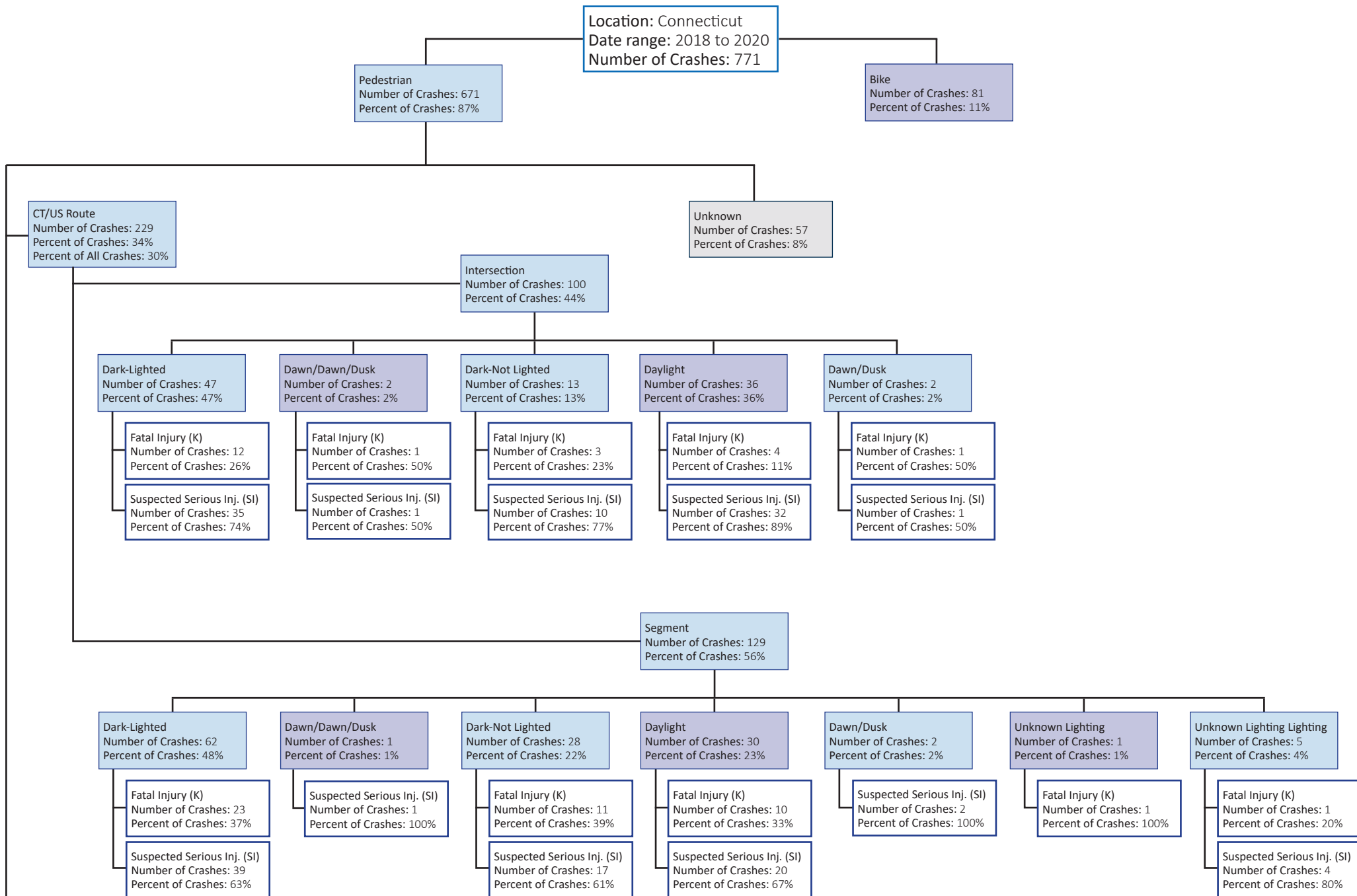


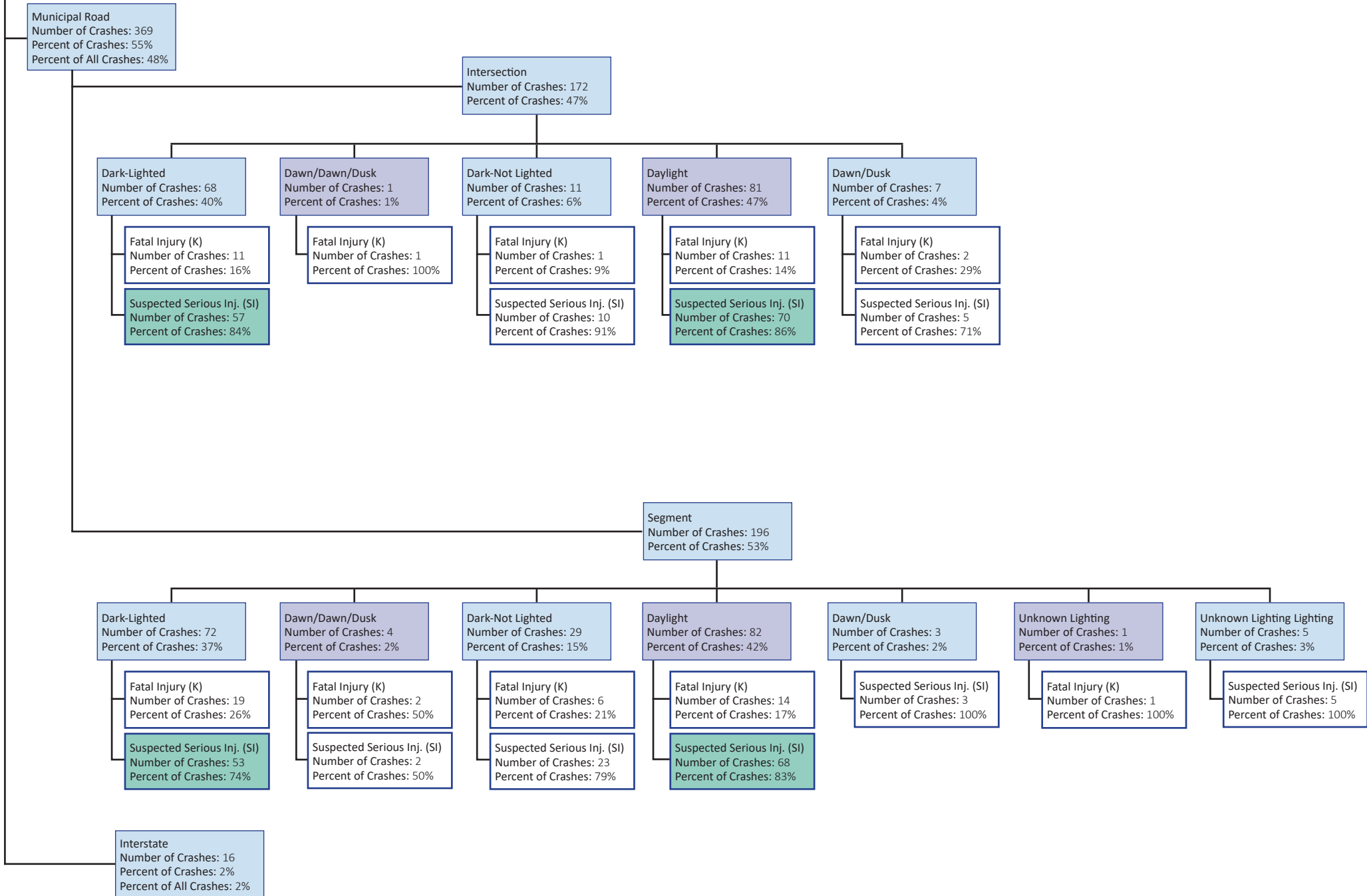
State Fixed Object by Functional Classification Fatal and Serious Injury Crash Tree

Location: State Roads
Date range: 2018 to 2020
Number of Crashes: 508

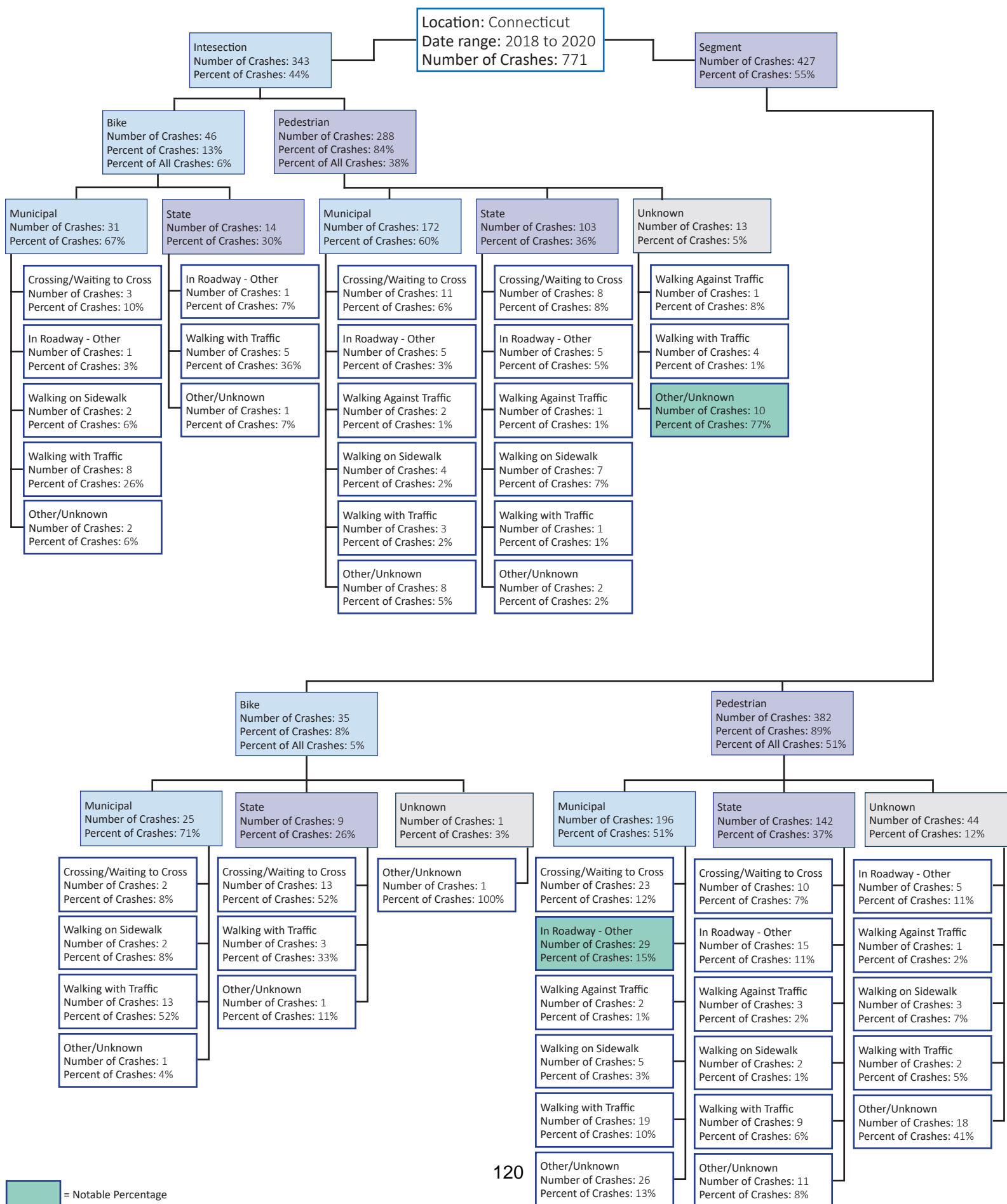


Fatal and Serious Injury Pedestrian and Bicycle Crash Tree

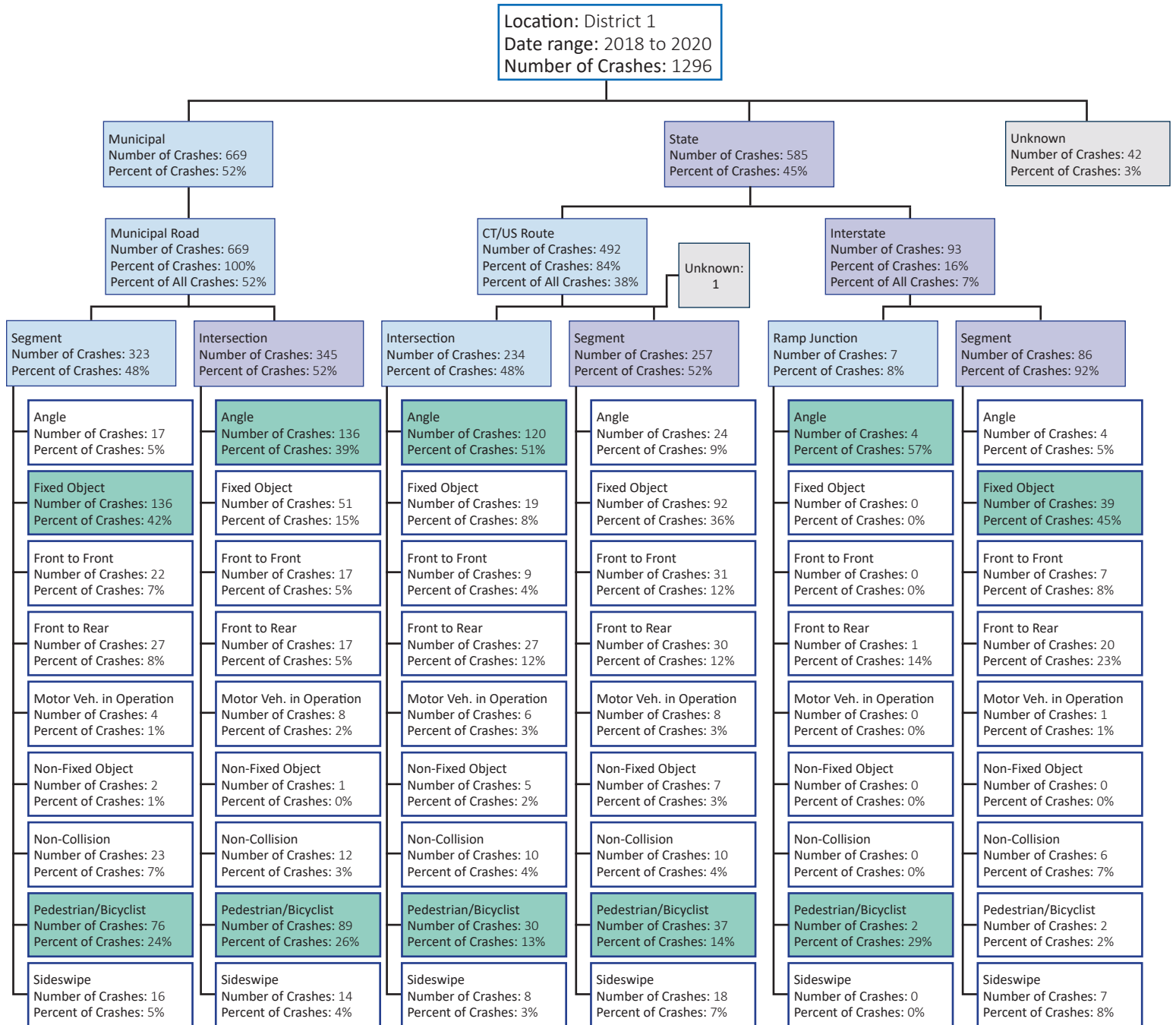




Connecticut Bike/Ped Fatal and Serious Injury Crash Location

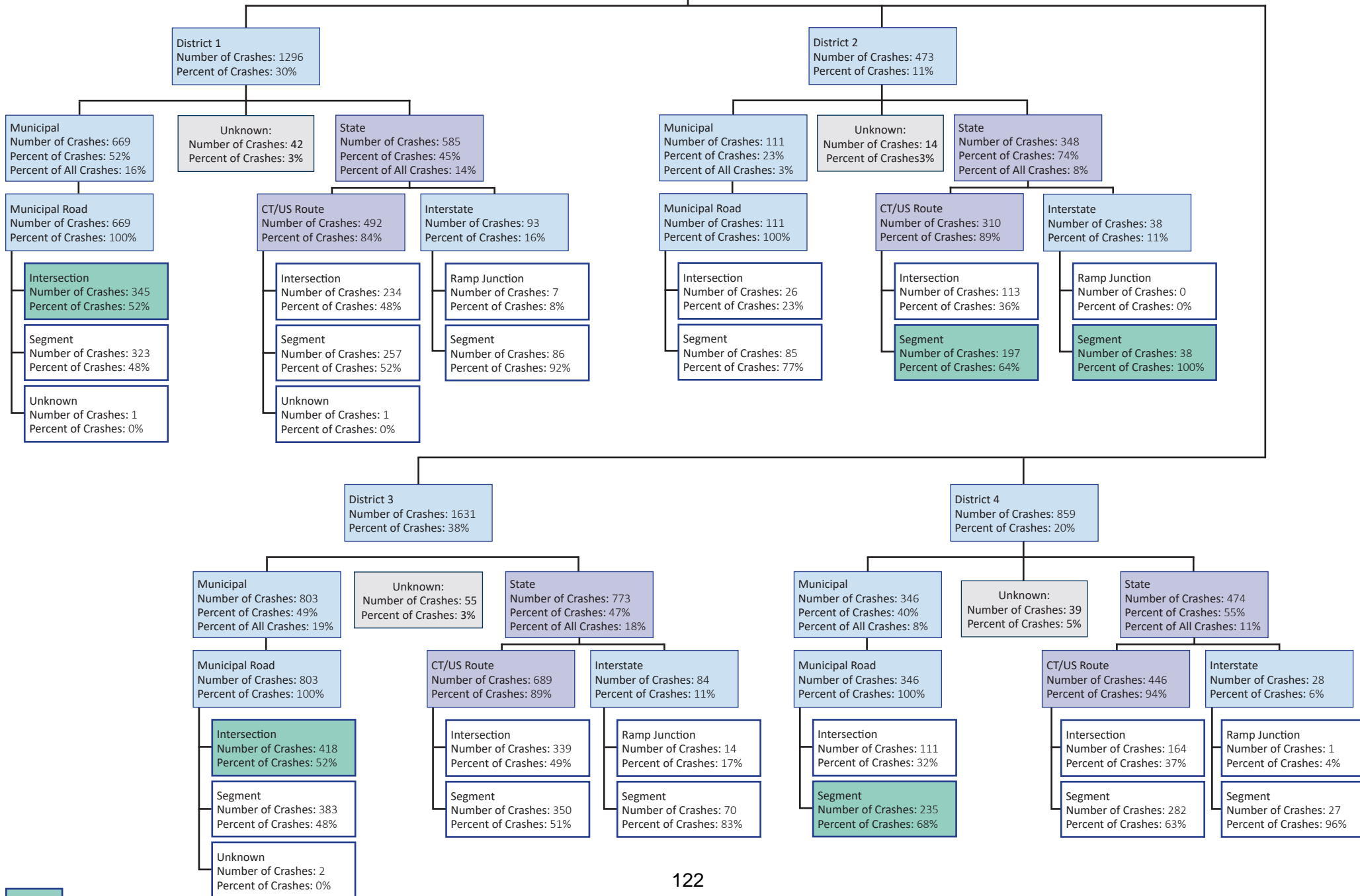


District 1 Fatal and Serious Injury Crash Tree

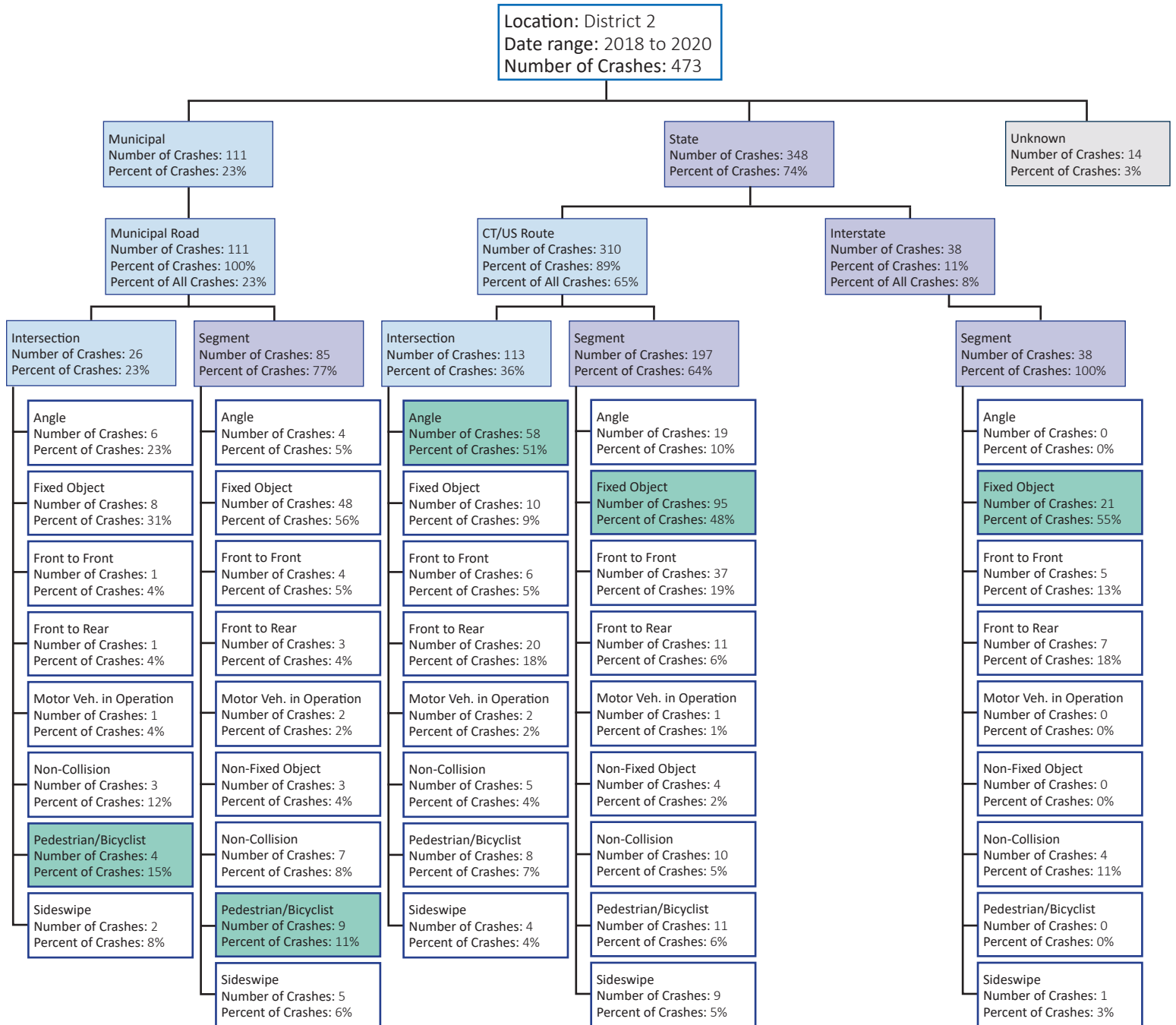


Summary District Fatal and Serious Injury Crash Tree

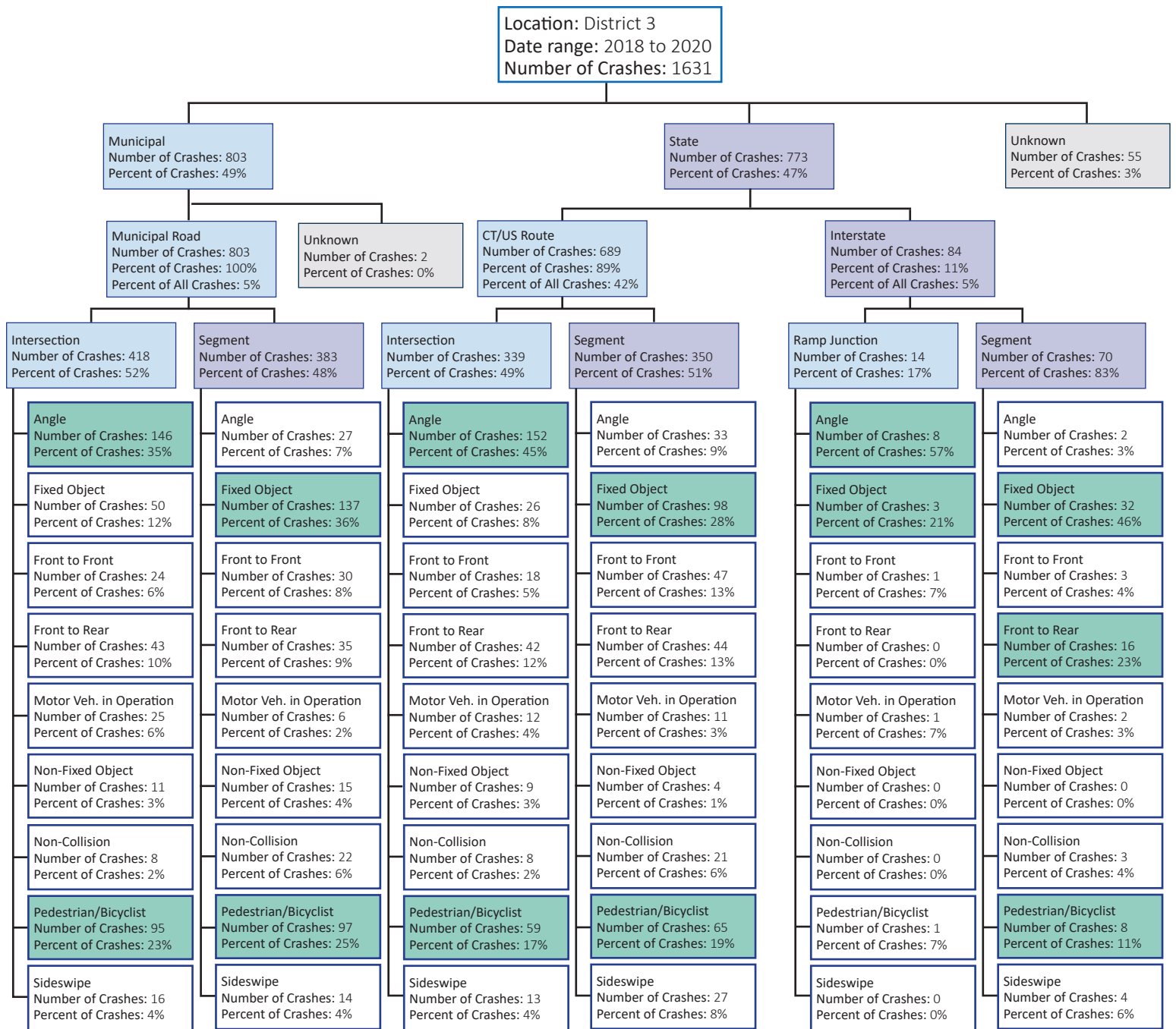
Location: Connecticut
Date range: 2018 to 2020
Number of Crashes: 4259



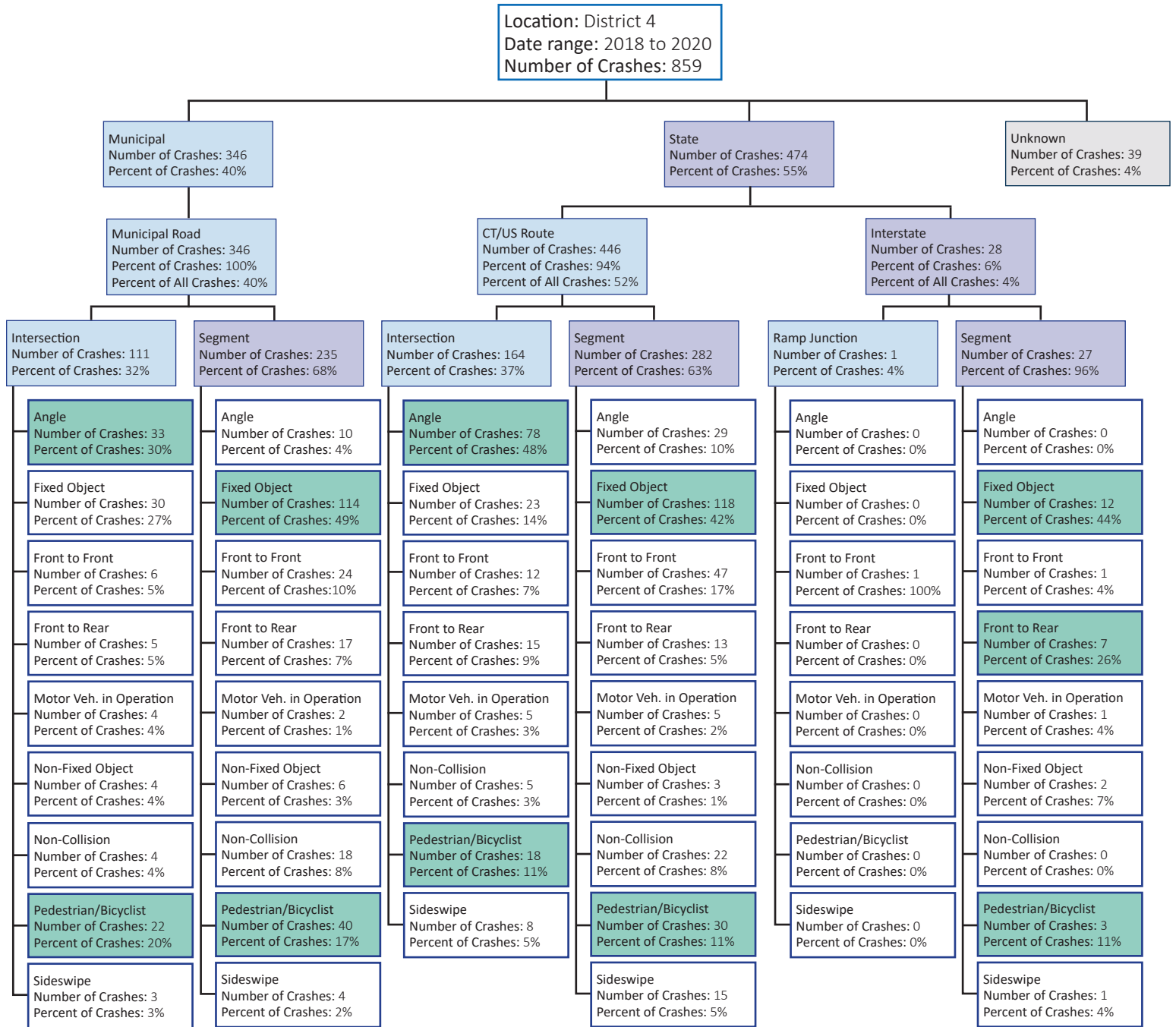
District 2 Fatal and Serious Injury Crash Tree



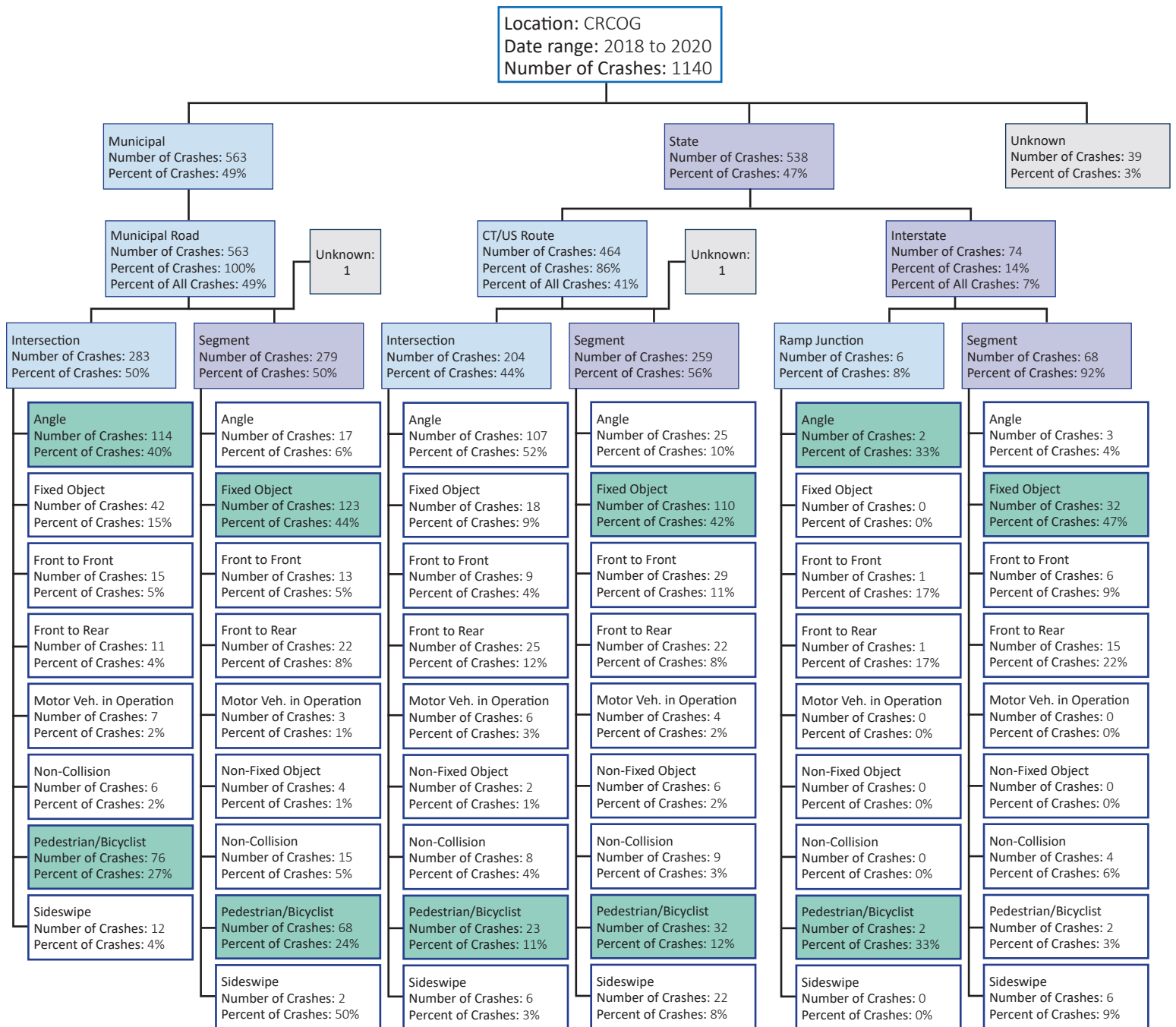
District 3 Fatal and Serious Injury Crash Tree



District 4 Fatal and Serious Injury Crash Tree

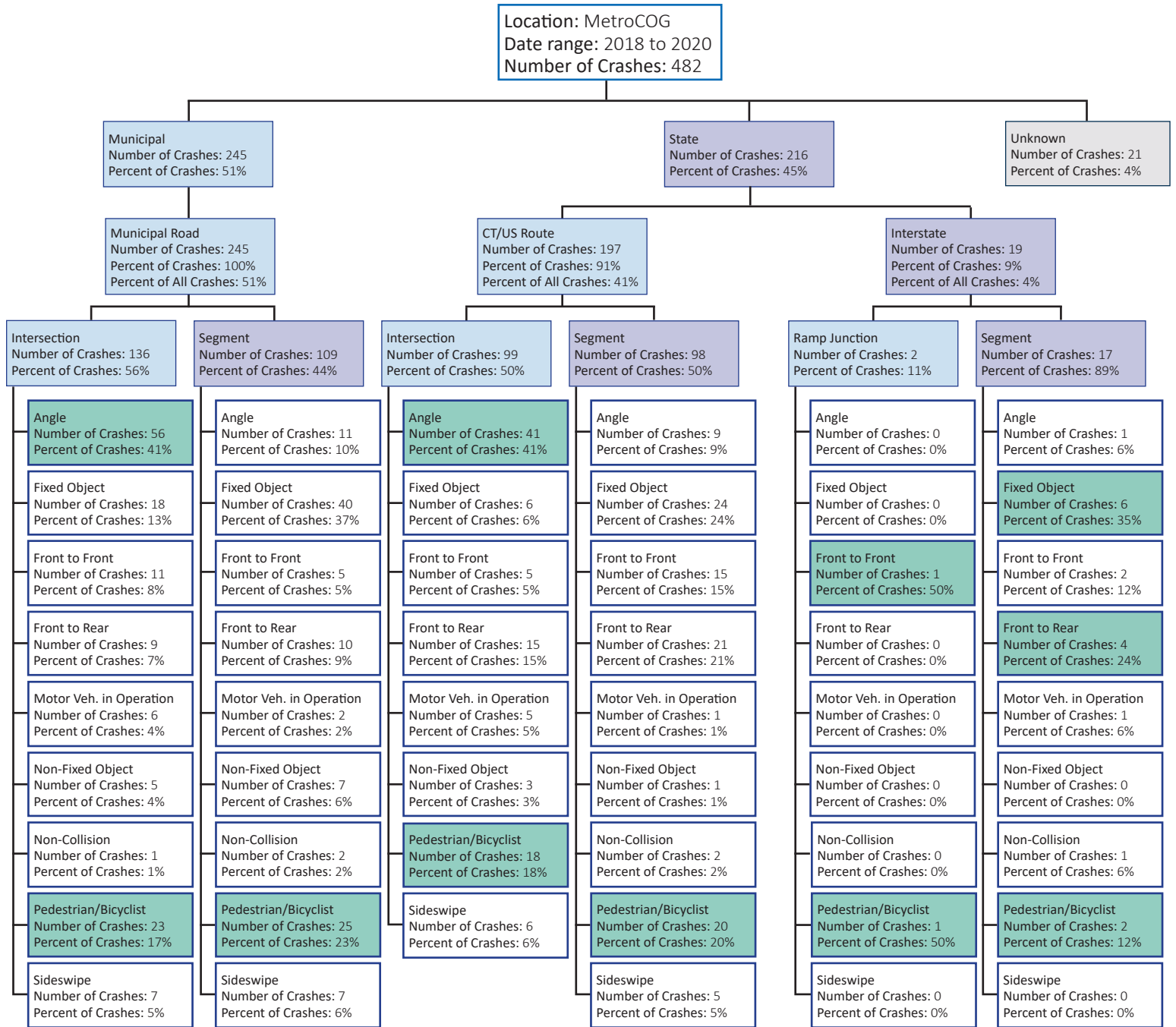


CRCOG Fatal and Serious Injury Crash Tree

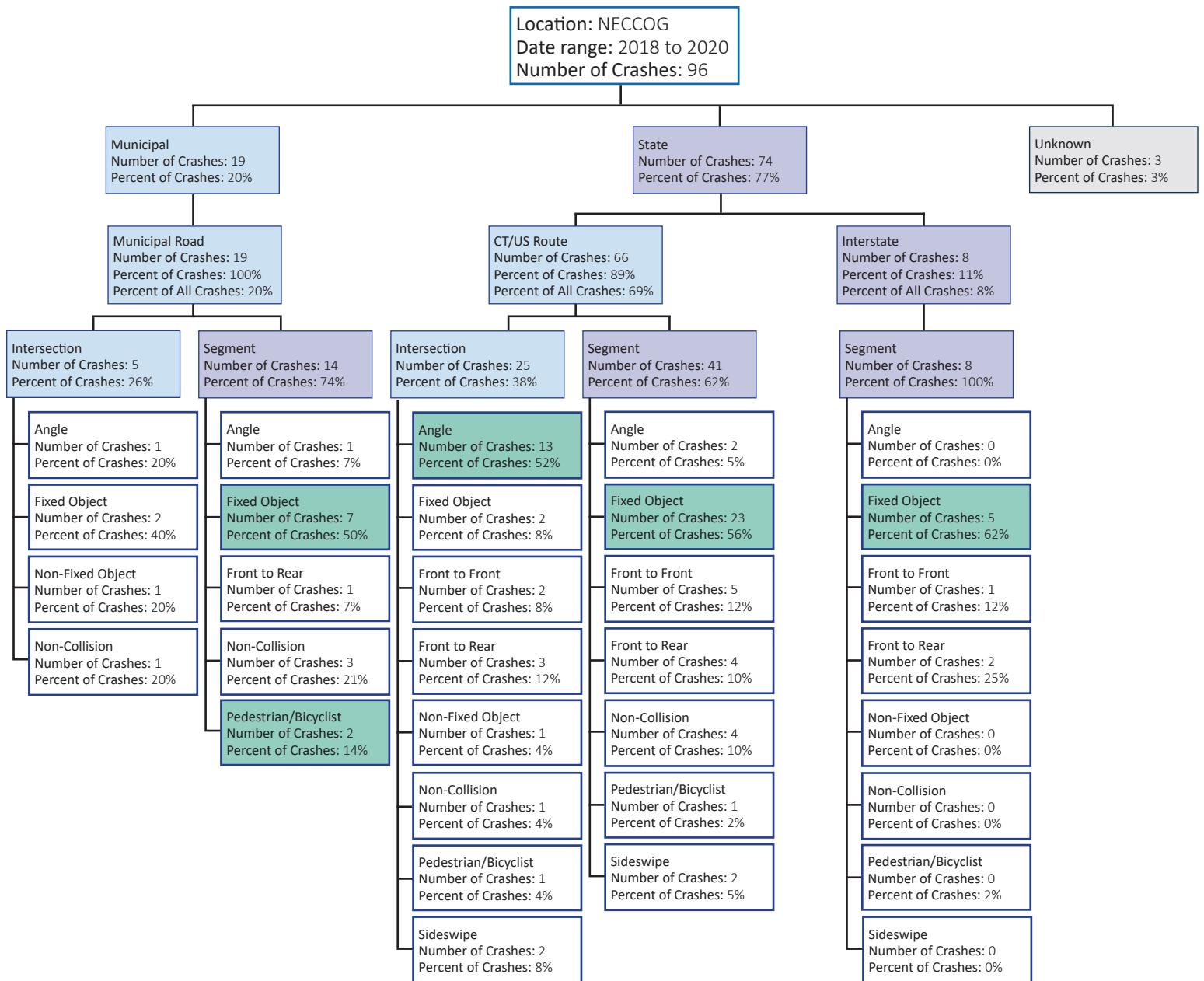


 = Notable Percentage

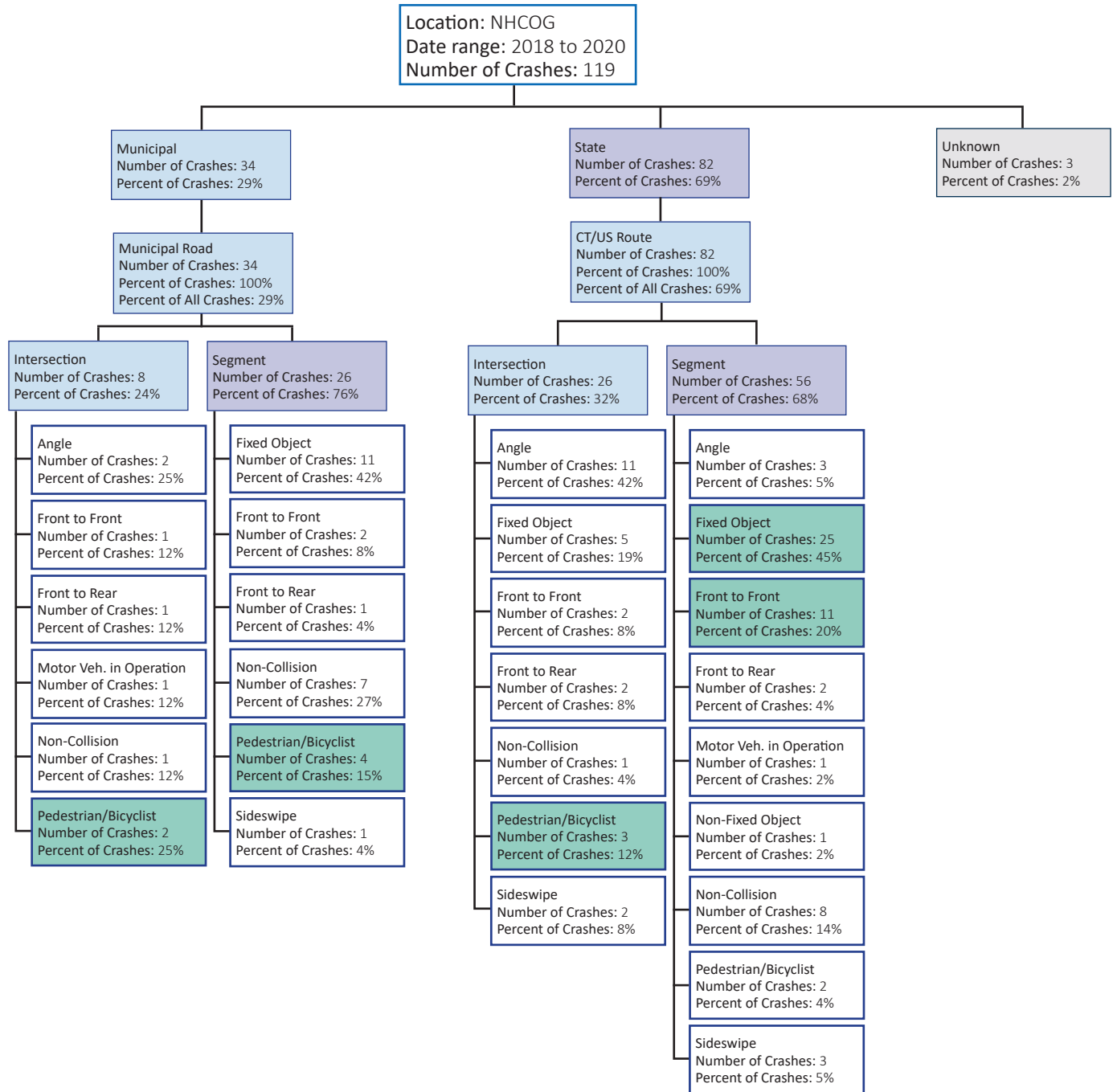
MetroCOG Fatal and Serious Injury Crash Tree



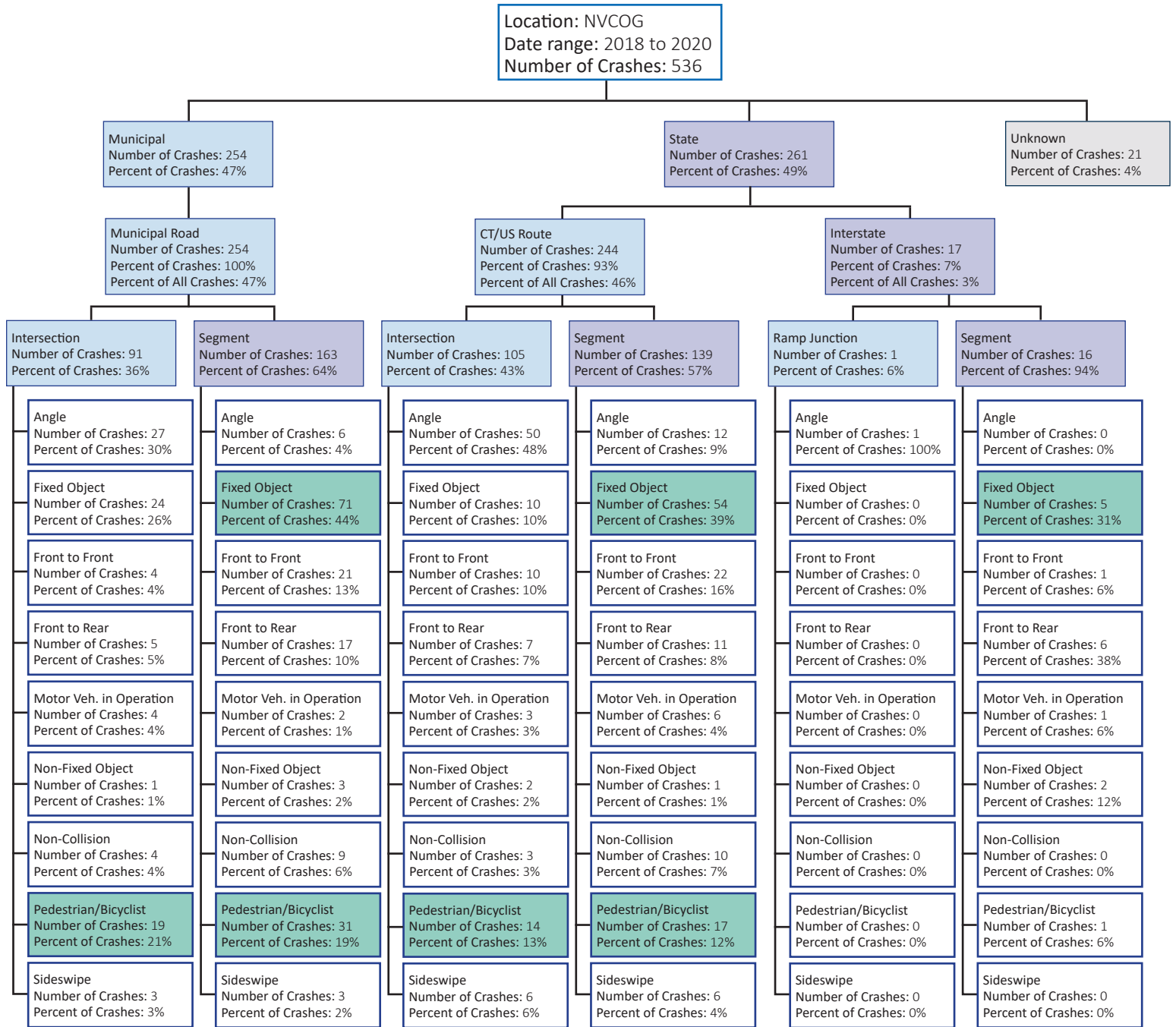
NECCOG Fatal and Serious Injury Crash Tree



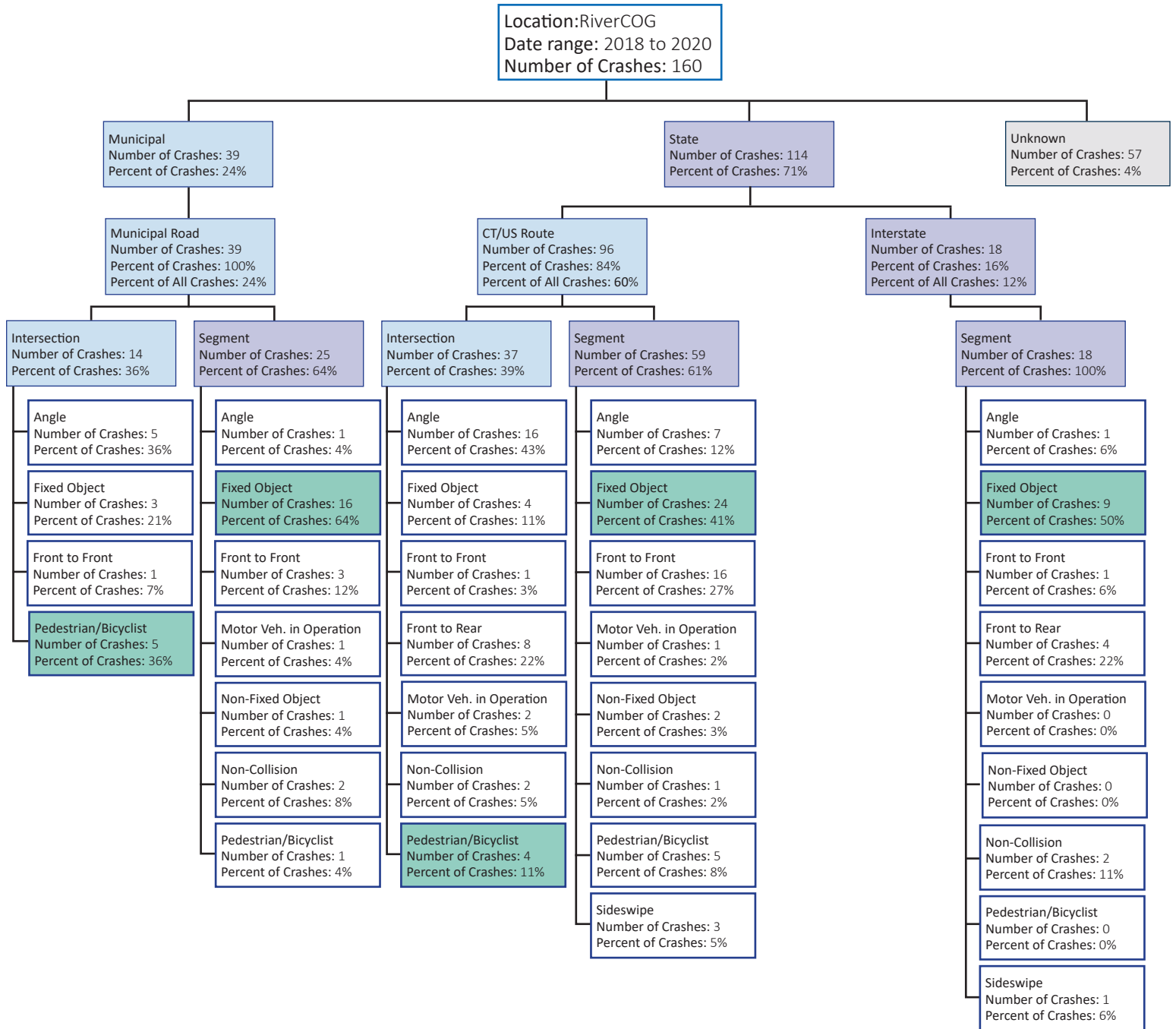
NHCOG Fatal and Serious Injury Crash Tree



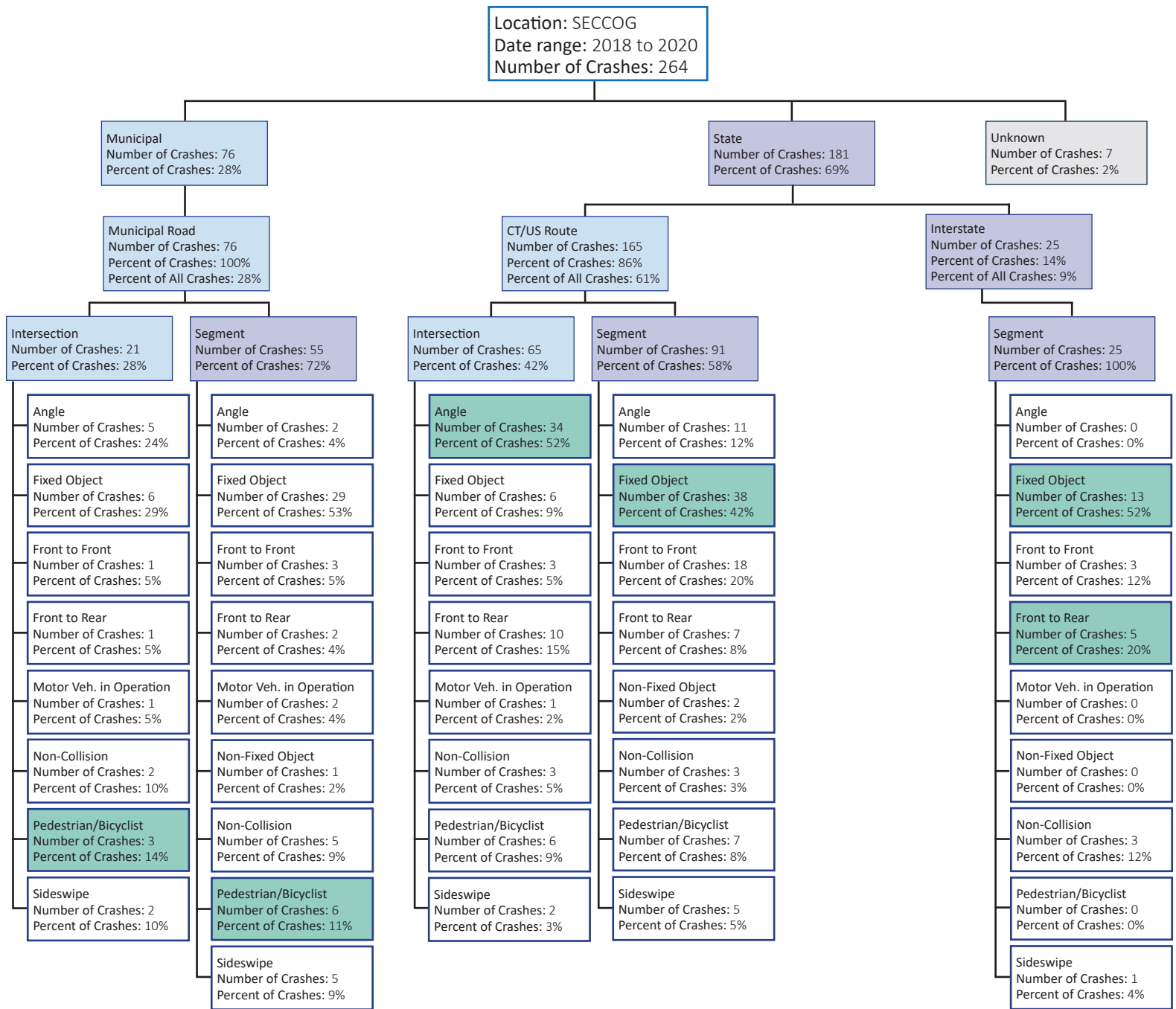
NVCOG Fatal and Serious Injury Crash Tree



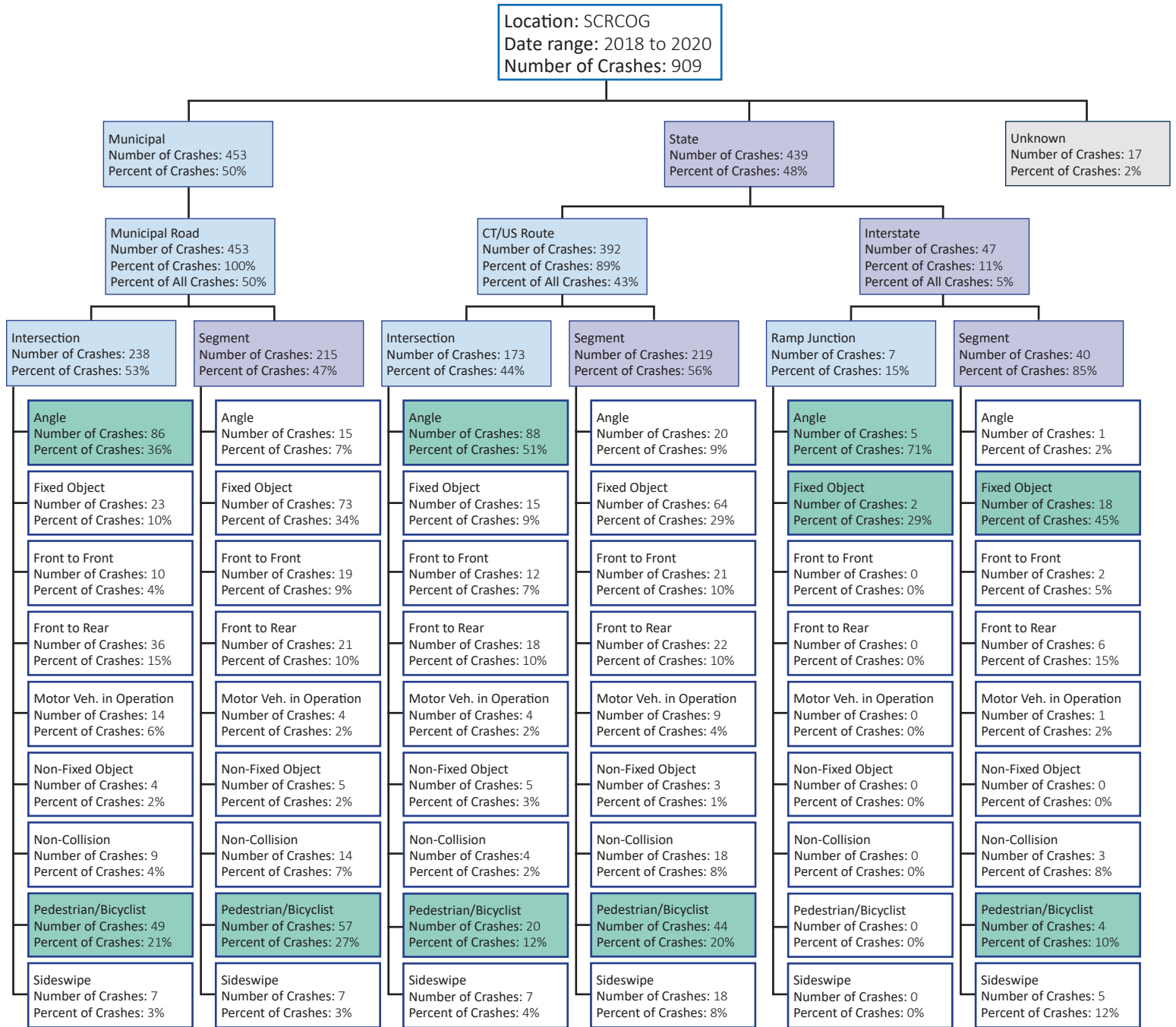
RiverCOG Fatal and Serious Injury Crash Tree



SECCOG Fatal and Serious Injury Crash Tree



SCRCOG Fatal and Serious Injury Crash Tree



WestCOG Fatal and Serious Injury Crash Tree

